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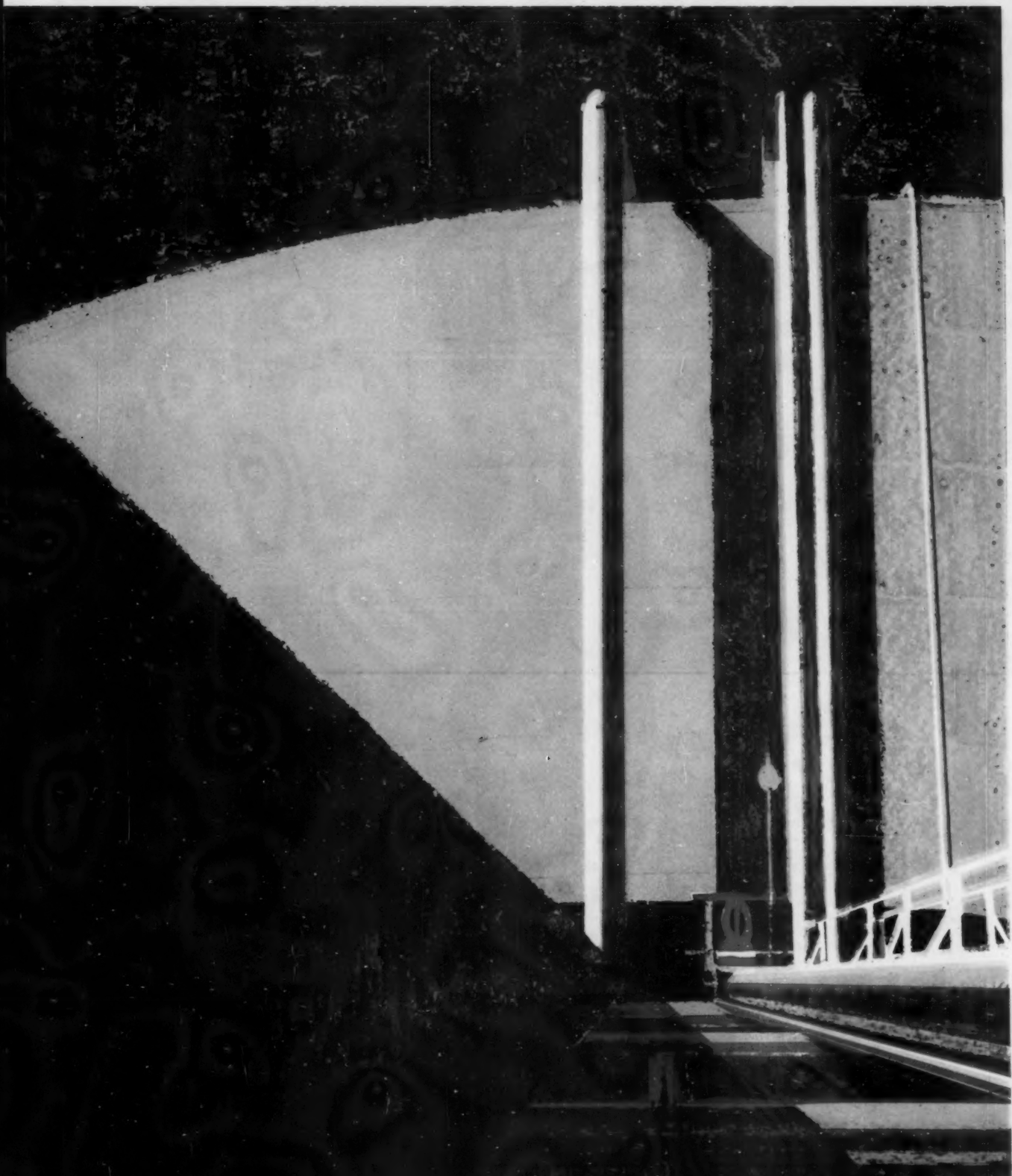

TISSAVARY

february 1956

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Temperatures Change – Readings Don't

Temperatures may jump or drop but the Cameron Mechanical Weight Indicator continues to show accurate weight—and in pounds not points. Since there is no hydraulic system there is no possibility of breakdown due to leakage of high pressure fluids.

The large yellow dial of the Type "C" with bold contrasting black and red numerals (determined by test to be the most legible colors) makes the indicator easily visible from any point on the rig floor.

The amazing accuracy of the Cameron Indicator assists the operator in maintaining the proper weight on bit during drilling operations—essential for cutting, fishing, packer setting or any bottom hole operation requiring precise control of weight. The case of the Cameron Weight Indicator is oil filled (like the Cameron Pressure Gauge) to provide a viscous damping of dial motion and to prevent damage from vibration.

A convenient exchange plan eliminates field repairs and assures fast economical service.

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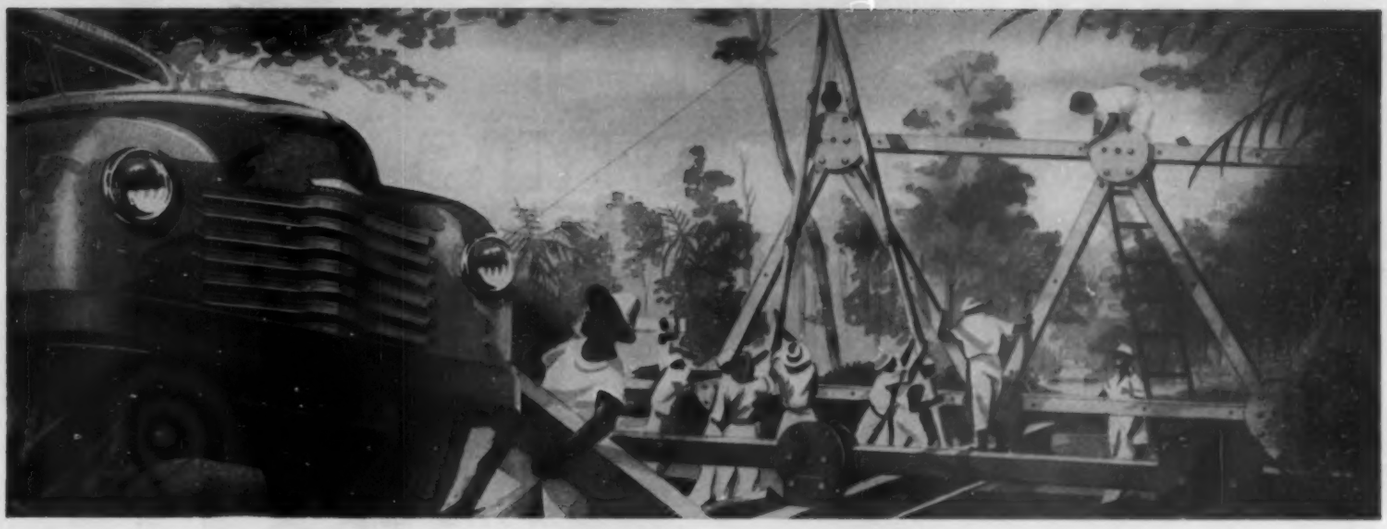
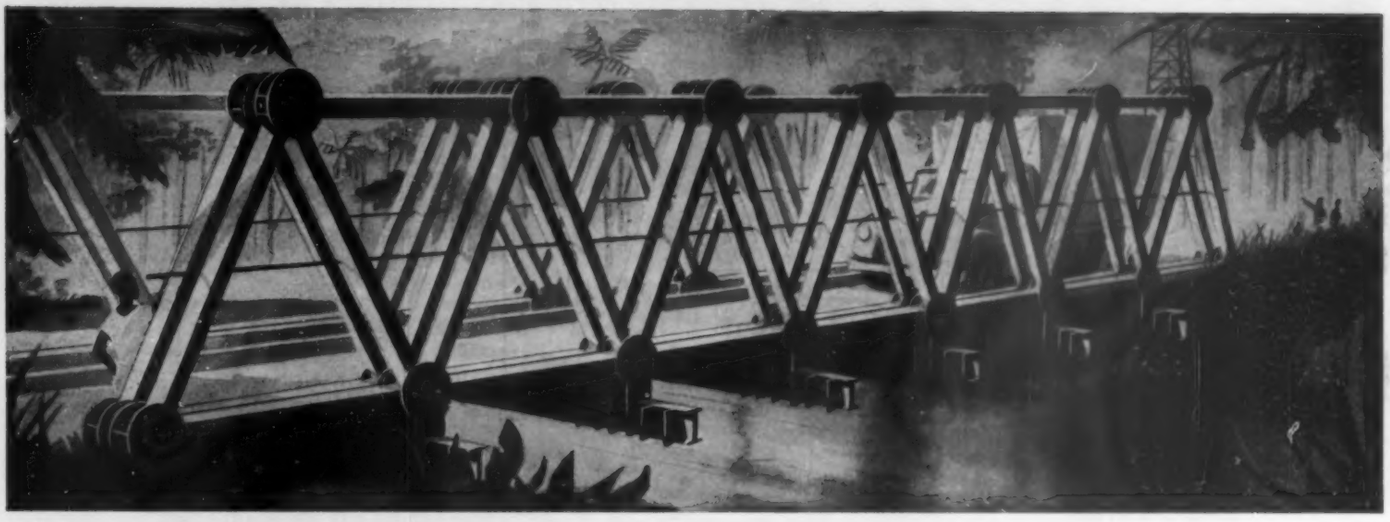
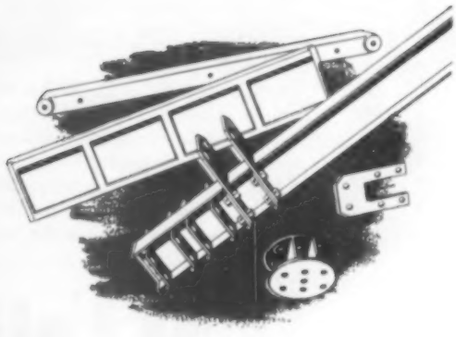


and quickly erected on . . .



remote up-country sites

Butterley Standard-Unit Bridges are in use all over the world where transport is difficult, skilled labour scarce or where site preparation has to be carried out under adverse conditions. From five standard units, all sizes of bridges can be built; the units can be sent by any form of transport; site erection is remarkably simple and swift with an absolute minimum of equipment.



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New Services • • • New Tools • • • New Methods • • • Outstanding Results

McCullough M-3 Guns Gain 760 B/D

Previous Attempt Failed To Get Penetration

Powerful McCullough M-3 Guns firing improved Ogival Bullets again proved their superior penetrating power in a recent job in this Texas well.

The well had first been perforated by another service company, but the operator was unable to break the formation down under 3500 pounds pump pressure.

Depth of operation was 9800'. 5½" O.D., 17 lb. casing had been cemented through the pay zone.

McCullough 4¼" O.D., 30-shot M-3 Perforators fired 84 improved ½" Ogival Bullets in the same interval previously perforated. The formation broke down at 1200 pounds pump pressure. After treating, the well made 760 barrels of oil per day—the best well in the field.

M-3 Guns Shoot 400 Holes in 73° Angle Well in Two Runs

Unusual Perforating Job Could Only Be Accomplished By Simultaneous Firing, Deep Penetrating McCullough M-3 Bullet Perforators

While unusual jobs such as this occur only infrequently, they serve to demonstrate the ability of McCullough Perforating Services to accomplish the tough jobs with the same speed, economy and satisfaction that characterize ordinary operations.

This well was directionally drilled from an onshore location out under the ocean bed. Due to the high degree angle of the well (73°) it was impossible to perforate by regular electric wire line methods.

8⅝" O.D., 36 lb. casing had been cemented in 12¼" hole. The interval to be perforated was from 6696' to 6796'.

Ten 4¼" O.D., 20-shot McCullough M-3 Guns (50') were screwed together and run in on 4½" F. H. drill pipe. A swab cup was arranged on a 1¾" O.D. probe, attached to the electric wire line and pumped down the drill pipe until it contacted a firing sub attached to the top of the guns.

Two sets of M-3 Guns of the above length were run, firing 400 ½" improved Ogival Bullets in the 100' zone. The entire job took only 26 hours to complete which included two round trips with the drill pipe and two runs with the probe. No trouble, no delay was experienced. The job was satisfactory in every respect.

Only McCullough M-3 Guns, firing all shots at one time, could successfully complete this unusual job. In addition, deep penetration through heavy casing cemented in large diameter hole was assured by the extra power of M-3 Guns firing improved Ogival Bullets—hardest shooting bullet perforators in the world.

Deep penetrating, accurately placed shots give you the results you want . . . better production. Always specify McCullough Perforating Service for MORE OIL!

Literature Available on McCullough M-3 Bullet Perforators

1. **Four-page illustrated bulletin, No. 203, gives advantages, characteristics, etc. of M-3 Bullet Perforators and improved Ogival Bullets.**
2. **Sixteen-page pocket brochure tells benefits of M-3 Perforators, supplemented by actual job reports.**

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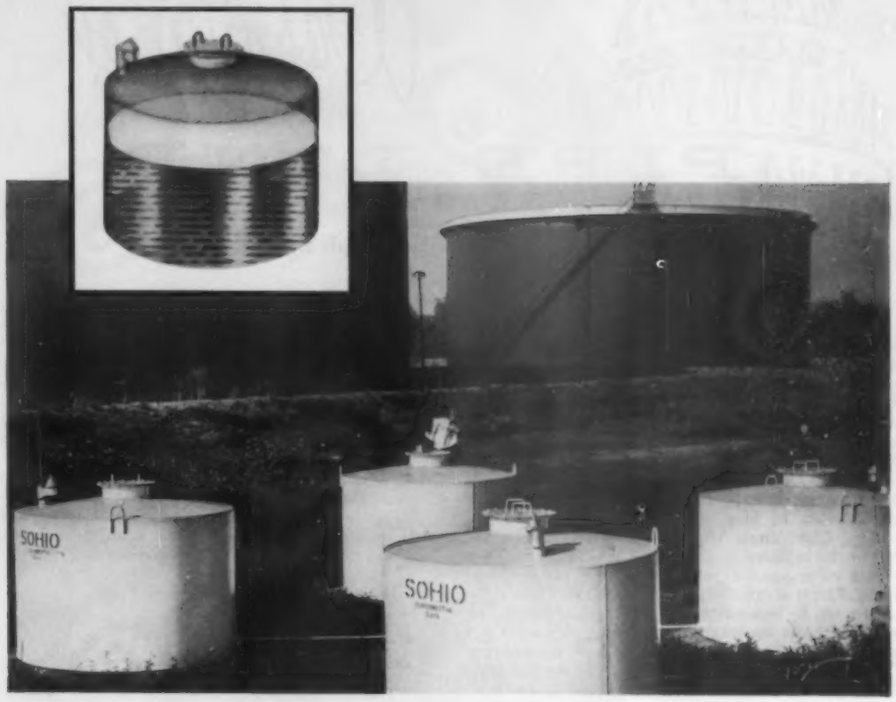
90%



A floating blanket of "Microballoon" spheres covering more than 750 square feet took about 40 minutes to install in a storage tank at a Standard Oil Company (Ohio) station in the United States.

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PAYS FOR ITSELF IN LESS THAN A YEAR

"Microballoon" spheres can save you money! They are tiny, hollow spheres made of UNION CARBIDE phenolic plastic and resemble reddish-brown flour. Millions of "Microballoon" spheres are pumped into a tank of crude oil and immediately rise to the top to form a half-inch protective layer. This locks in the original value of the crude oil throughout long storage periods.

A floating blanket of "Microballoon" spheres fits snugly against tank sides and internal supports, keeping the surfaces sealed as the level changes. These spheres, made of UNION CARBIDE phenolic plastic, resist years of corrosive action. Their non-abrading qualities prevent damage to pipe lines and pumping equipment.

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Phenolic Resins

Washington PIPE LINE

By Joseph B. Huttlinger

U. S. Department of Defense is making plans to reserve thousands of acres in the offshore area for firing and testing ranges. Frank M. Ewing, deputy assistant secretary of defense, told the House Public Lands Committee this may interfere somewhat with oil and gas work off the coast of California and in the Gulf of Mexico. He said a committee of the Departments of the Army, Navy and Air Force is working up a policy about military use of the offshore areas. He expects this will be completed and made public by May of this year.

Rep. Clair Engle (D., Calif.) of the committee, urged the military to go slow in taking over waters which oil companies need for oil and gas development. The chairman also suggested that if the military were to become greedy about reservations, he might suggest amending the Submerged Lands Act to curb the military. Otherwise, he said, the military "might prevent the drilling for oil" in the valuable lands.

New Import Study

A new look at the government's formula as to the proper level of oil imports is in the making. A year ago, a Cabinet committee suggested that imports of crude and residual fuel oil should be held to the 1954 ratio. Now, a year later, a new look is being taken. Oil importers are preparing to urge an upward revision in imports; U.S. producers are expecting to urge a downward revision.

A public hearing before Dr. Arthur S. Flemming, director of defense mobilization, may start off the steps toward revision. The Cabinet Committee formula, even though it was a mere suggestion to oil importing companies, has served as a brake to oil imports, without doubt. At that, many companies have exceeded the formula. In strong words, Russell B. Brown, counsel for the Independent Producers of America, says oil importers show "an almost unbelievable disregard for our government, approaching contempt."

U.S. coal producers are also asking Congress for legislation to set up hard and fast quotas. They are unlikely to get far, if the latest official word from Congress is an accurate indication of sentiment.

A subcommittee on the joint economic report asks more trade, and criticizes industries which "wrap themselves in the flag" as they plead against imports. The subcommittee, in a formal report, also takes a dim view of use of the escape clause to protect U.S. industry. And it emphasizes "the changing nature of war" and finds fault with the "fortress America" concept.

McKay to Retire?

Secretary of the Interior Douglas McKay, former governor of Oregon, has given signs that he is ready to retire from the government. Recently, he retired from the automobile dealer company which he founded and headed up.

Smog Control

To cut down on smog, the U.S. Bureau of Mines has begun a long-range study of exhaust gases from automobiles.

"Exhaust gases from automobile motors and other internal combustion engines contribute significantly to contaminants in city air," according to T. H. Miller, acting director of the bureau. "Development of methods for eliminating these contaminants will be speeded if we know more about them." The work is being done at the Bureau's petroleum experiment station, Bartlesville, Okla.

F.P.C. Faces Job on Natural Gas Regulation

The U.S. Federal Power Commission, which is still in its infancy as it tries to regulate the prices of natural gas sold by some 5,000 natural gas producers, has a tremendous task. During the first 18 months of the new price and sales controls over independent natural gas producers, the FPC received a total of 13,531 rate filings from independent producers. The filings were asked of the producers in the summer of 1954, shortly after the U.S. Supreme Court directed the FPC to take control of prices and sales of gas sold by the producers. Before that, the FPC had controlled only gas production by long distance pipe lines, but not by independent producers.

More than half the filings, some 7,038, were of present rates at which the producer was selling his gas, a rate the FPC wants as a bench-mark to measure any changes in the future. A total of 3,229 asked rate increases which would total $48,546,537 a year, but the FPC suspended 221 of these, totaling $15,798,041 a year. Many are still suspended while the FPC studies them further. More than half the rate increase filings were to pass on raises in state and local taxes, totaling $6,904,444. Another 1,183 filings asked decreases in rates due to tax decreases of $1,240,092.

Now that the FPC has had control over sales and prices of gas producers for nearly 20 months, the remarkable fact is that the Commission has yet to decide just how it can or should exercise its controls. Only recently, after public hearings, staff reports and much study, the FPC threw up its hands on the matter of principles and methods of exercising controls. Instead, it said in a formal press release, it would go on a case-by-case basis. Apparently, the FPC feels there is no way to handle the thing on a clear-cut, businesslike basis. The gas production business, it would seem, is entirely too complicated.

The problem could become academic if the U.S. Congress completes legislation this year to ease the federal controls. The House has passed a bill, and the Senate began consideration of a similar measure in January. A month or two, perhaps March, could see a bill on the desk of President Eisenhower for signature. The chances are the President would sign a reasonable bill, although few things are certain in Washington.

A bill, if it clears the Congress for the White House, could be in many forms. Outlook is against a bill to remove federal controls completely over gas producers. Instead, some controls will be left to the FPC. If this is the outcome, the FPC would continue as a powerful influence in the lives of gas producers who are, by and large, also crude petroleum producers.

National Petroleum Council Under Attack

The National Petroleum Council, which advises the Department of Interior on major petroleum and natural gas matters, is under attack again this election year. Department of Justice has been circulating a memorandum of rules for advisory committees, such as the NPC. One of the rules would forbid any industry committee to have its own chairman.

Rep. Emanuel Celler (D., N.Y.), meanwhile, is urging legislation to forbid the Council to have its own chairman and set its own agenda. He also looks toward March as the date of full-scale hearings into NPC and Interior's Office of Oil and Gas.

Record Wells In 1956

Secretary of Commerce Sinclair F. Weeks, in his forecast for the year 1956, foresees "a record number of oil wells" to be drilled. Last year the total was about 57,000 in the U.S.

Petroleum Consultants In Government

Men from industry who agree to serve the government as consultants face one more regulation today under the latest executive order of President Eisenhower. They must tell all companies in which they have any interest, even if only as small stockholders. This information, then, is spread on the public record in the Federal Register. For instance, Lynn S. Madsen, a consultant to the Interior Department, explained that he is from Arabian-American Oil Co. and intends to return. He listed these among companies in which he has stock interests: Mueller Brass; Union Electric of Missouri; Heyden Chemical; Dow Chemical; Technicolor; Sperry Rond; U.S. Government bonds. He has bank deposits at Riggs National Bank, Washington, D.C. and Chase Manhattan National Bank, New York, N. Y.

Pipe Line Inquiry

Butte Pipe Line Co., builder of a line from Glendive, Mont., to Guernsey, Wyo., may be in the news again. A Senate judiciary subcommittee is considering a report on its inquiry into the line last summer. Then, Wiley L. Moore, of Standard Pipe Line Co., Atlanta, Ga., said Butte "adopted" his idea for a line. Mr. Moore, meanwhile, says he is considering filing a civil suit against Butte and its owners, Shell Oil Co., Placid Oil Co., Murphy Corp. and Northern Pacific Railway.

West Coast Pipe Line Co., Dallas, was up for attention again in January by a House Armed Services subcommittee. The subcommittee is considering whether to recommend government aid for the proposed crude oil line on the basis of defense need. West Coast wants to build from West Texas to near Los Angeles. Views of the military authorities, including Admiral Arthur Radford, chairman of the joint chiefs of staff, are to be decisive.

New Products Line Sought By Government

U.S. government, which has ruled, tentatively, against government aids for an oil products pipe line from the Beaumont, Texas, area to the East Coast, now seeks another type of line. This would be from Pittsburgh, Penna., to the East Coast. This route, the U.S. feels, would be in critical need of oil pipe line capacity in the event of war.

Dr. Arthur S. Flemming, defense mobilizer, is looking at plans to obtain such a line by several methods. One is for the government to buy the line pipe and equipment now and stockpile it for use in the event of war. Legislation may be needed, he believes. At present, in peacetime, such a line is not economically feasible, he feels.

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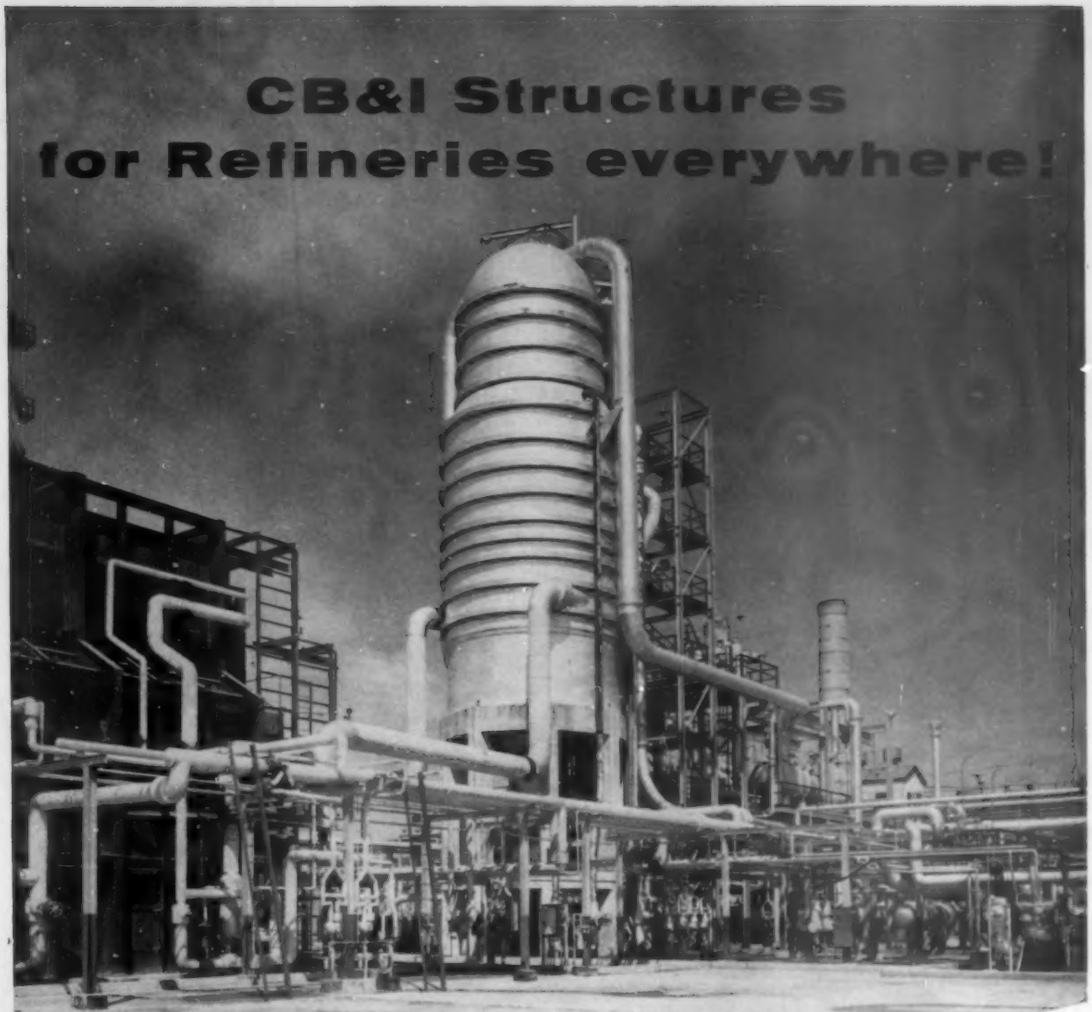

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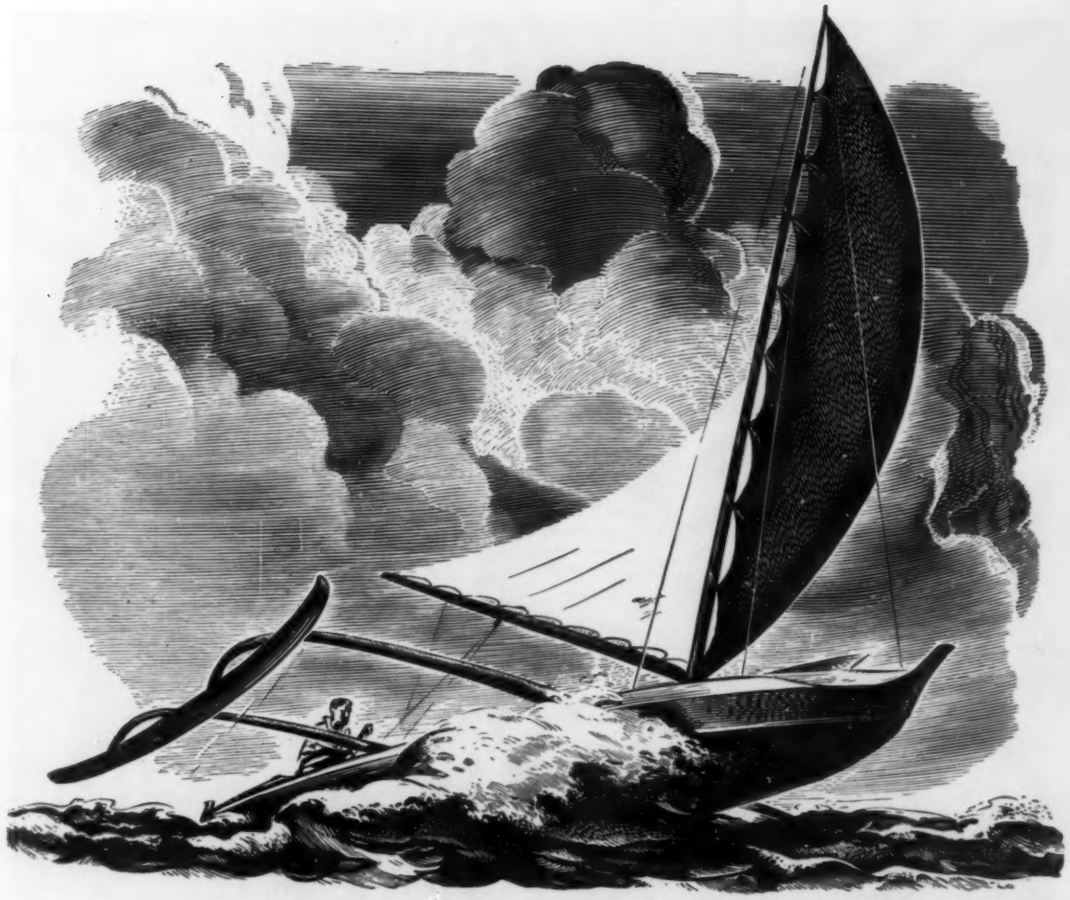

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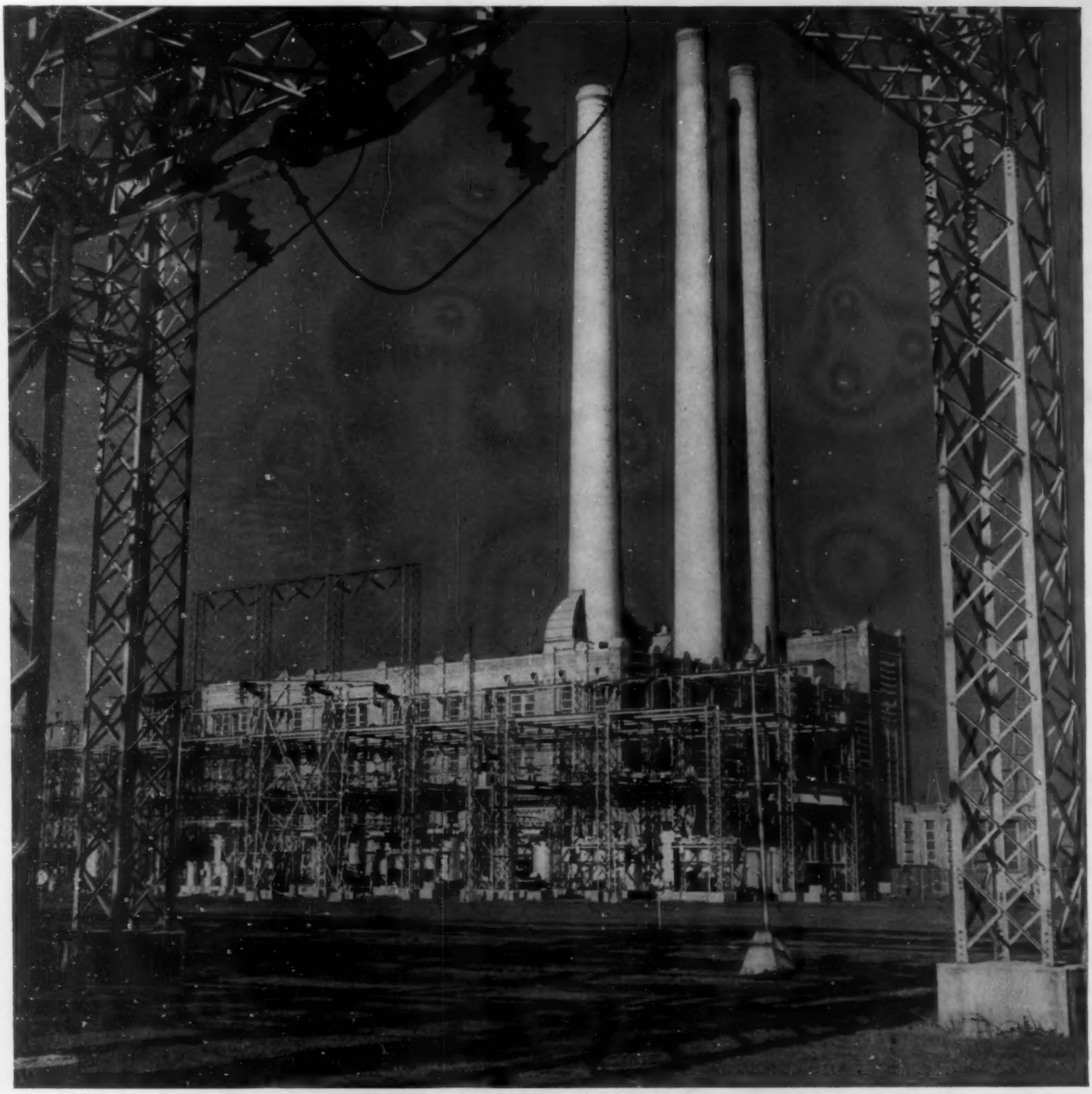

"Our forecasts indicate that even twenty years from now . . . the atom will still account for only a small part of a greatly expanded amount of total energy consumed. In fact, we expect that in those countries where atomic power is developed, it will have the effect of increasing the consumption of oil products. Atomic power will provide the kind of energy adaptable to large-scale industrialization which, in turn, is the setting for an increased use of machines and equipment which depend for their power on oil. So we welcome the atom as a partner in the energy picture."

A statement by Eugene Holman, Chairman of the Board, Standard Oil Company (New Jersey)

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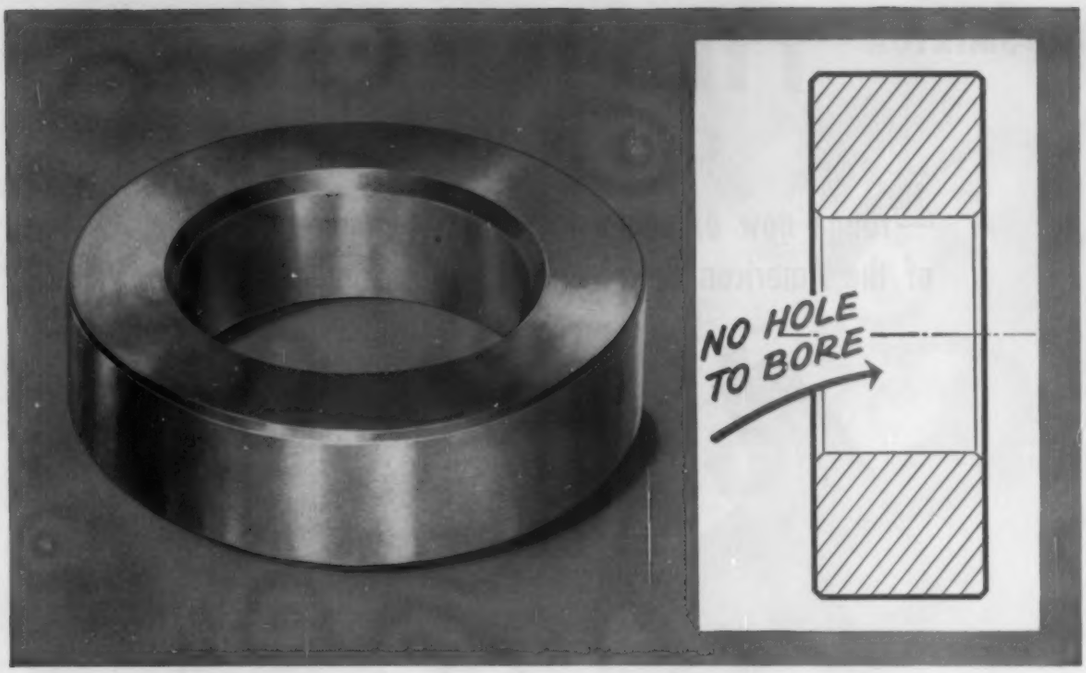

Steps up gear blank production 300% by switching from bar stock to TIMKEN® steel tubing

AN engine manufacturer felt that his gear blanks were costing him too much to make. The center hole had to be bored out of solid bar stock. It took a whole hour to turn out 29 blanks. And a lot of steel was wasted in the process.

So the manufacturer discussed his problem with metallurgists of the Timken Company, experts in fine alloy steel. After study they recommended a change in production methods together with a switch to Timken® seamless steel tubing in place of bar stock.

With Timken seamless steel tubing, the center hole is already there. It doesn't have to be bored out. Finish boring was the engine maker's first production step. And with Timken steel tubing his gear blanks are now being turned out at 120 to 130 an hour—an increase of 300%.

Machining costs have been cut by more than half. And because the center hole is "built-in", no steel is wasted.

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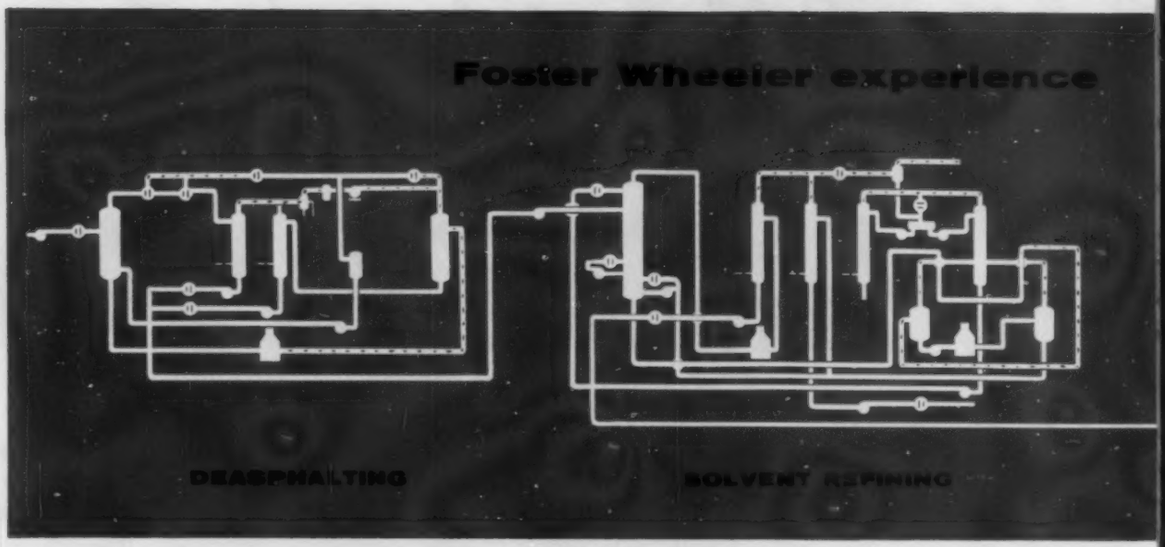
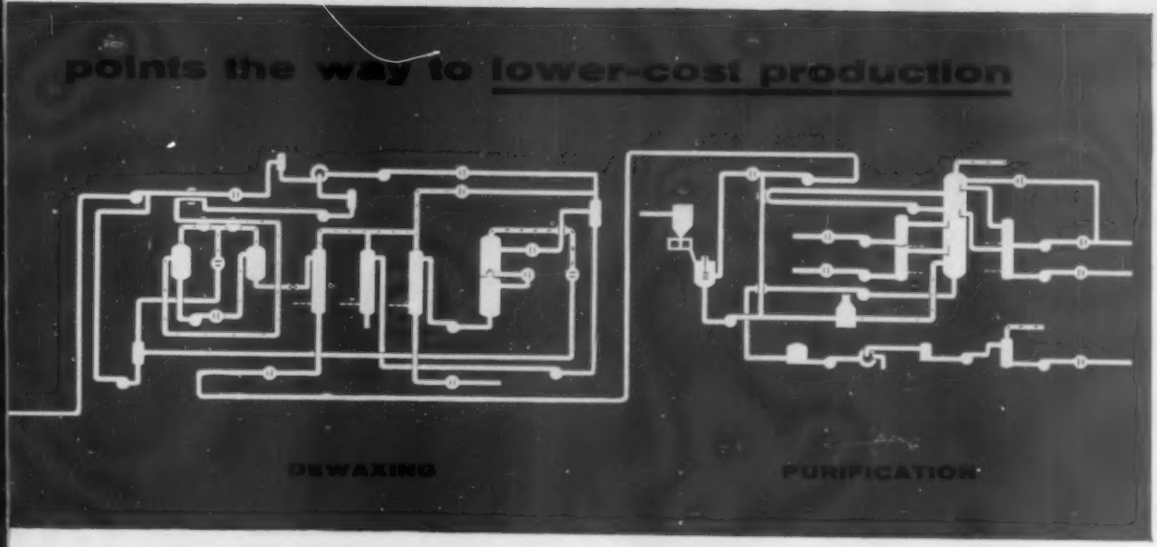
lube



Complete lube oil plant, designed and constructed by Foster Wheeler at England's largest refinery. Process units, in sequence from right to left, are as follows: propane deasphalting, phenol extraction, propane dewaxing and clay contact-vacuum rerun. Foster Wheeler is now building complete lube plants in the United States and Iraq.

oils

points the way to lower-cost production



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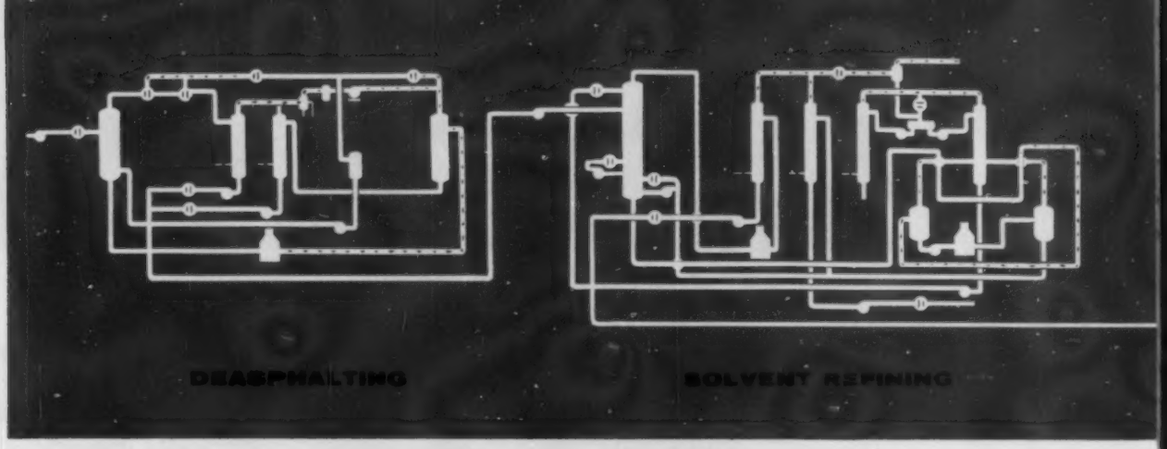
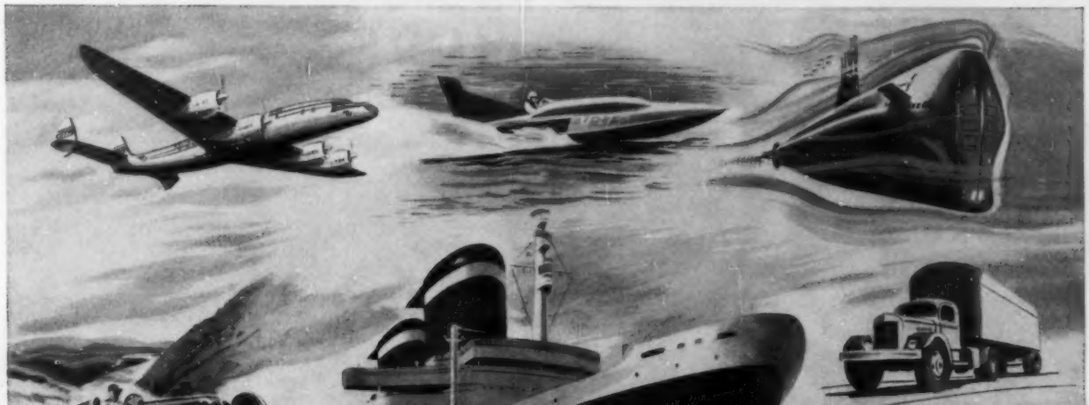
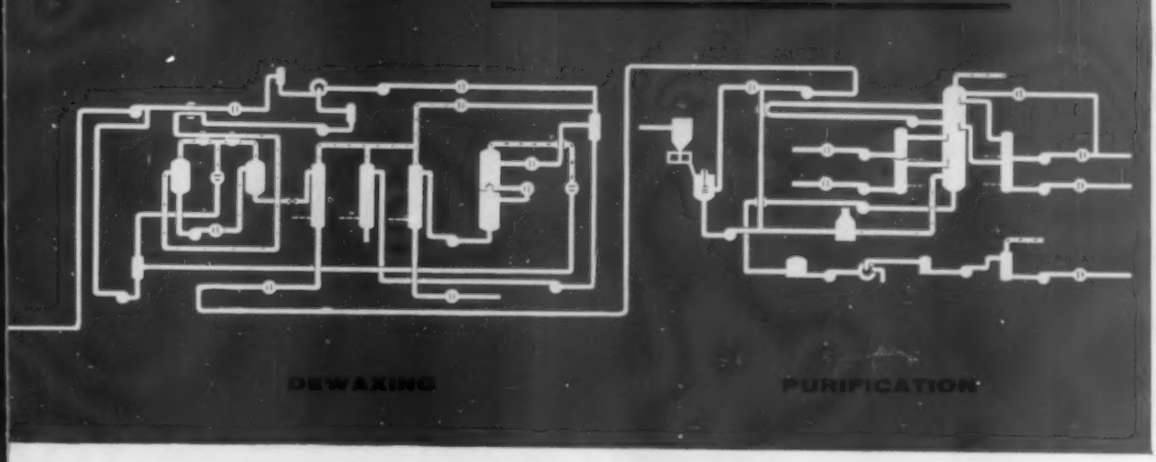


Complete lube oil plant, designed and constructed by Foster Wheeler at England's largest refinery. Process units, in sequence from right to left, are as follows: propane deasphalting, phenol extraction, propane dewaxing and clay contact-vacuum rerun. Foster Wheeler is now building complete lube plants in the United States and Iraq.

PROTECTION for the wheels that make the world go 'round!





NEW ADVANCES in refining processes and equipment have resulted in substantial increases in the overall efficiency of lubricating oil production—contributing to higher sustained output of high quality oils at lower unit production cost.

In the construction of new lube oil plants or modernization of existing facilities, Foster Wheeler's long experience in this specialized field is your best assurance of complete satisfaction, from initial planning to final installation and on-stream service. Foster Wheeler process design engineers offer more than 20 years of continuous and cumulative experience in lube oil manufacture. Their intimate knowledge of all phases of design, engineering and construction—plus their close relationship with all licensor companies—can save time, effort and expense in any expansion or modernization program. *Foster Wheeler Corporation, 165 Broadway, New York 6, N. Y.*

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DU PONT

PETROLEUM CHEMICALS DIVISION NEWS

DU PONT

February ★ *One of a Series of Interest to the Petroleum Industry* ★ *1956*

Question Box

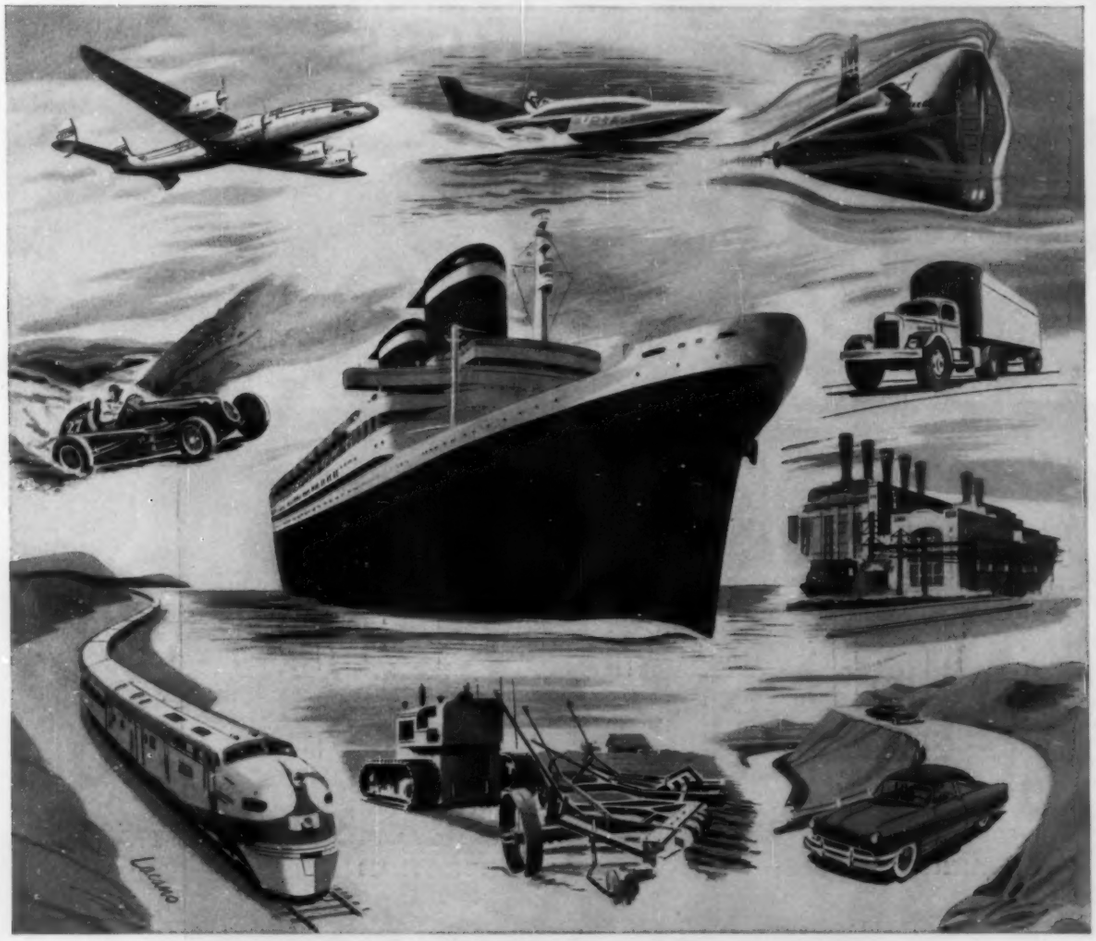
Want to get your TEL-handling people to think of safety "as a way of life"? Then you'll be interested in reading about the Du Pont Lead Hazard Clinic.

What makes a construction safety program, and what are the returns on a safety investment? To obtain a print of the movie that gives the answers, see the article on our film, "Builders of Tomorrow."

Du Pont Lead Hazard Clinic helps promote safe TEL handling through education

Because the dangers inherent in the use of tetraethyl lead are of a serious nature, the Du Pont Company, as supplier of this compound, offers refiners a program to help maintain safe handling operations. Originated in 1951, the

PROTECTION for the wheels that make the world go 'round!



For everything that runs, there is a correct Flying Red Horse Lubricant!

THOUSANDS of years ago some obscure genius invented the wheel. With it he made possible most of today's mechanical marvels—and at the same time created a need—*Lubrication!*

This need has become so vital over the centuries that today transportation and industry could not function without lubricants and lubrication knowledge. The Socony Mobil Oil Company is a leader in this specialized field.

For over 90 years Socony Mobil has met the lubrication requirements of pioneers in many fields. Aviation's Wright Brothers . . . early car makers . . . the inventor of the Diesel engine are only a few who have called on the Flying Red Horse for specialized lubricants.

Today, new developments such as atomic power, jet engines and gas turbines pose new and complex lubrication problems. Socony Mobil Oil is proud that it's being called on to solve these problems and plans to continue to devote its facilities and products to keeping the wheels of the world moving.

The Leader in Lubrication for nearly a Century!

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PETROLEUM CHEMICALS DIVISION NEWS

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Who heads the Petroleum Chemicals Division Eastern Regional Lab? We'd like you to meet *Ed Jeffus.*

Have you heard about the oil industry's "best seller"? See the story about "Speak to the Earth."

THE DOLLARS AND CENTS OF SAFETY

New film of interest to refinery construction personnel

"The Builders of Tomorrow" is the title of a film about accidents that never happened. More importantly, it illustrates how and why they never happened.

This 28-minute color movie was made on location as the Du Pont Engineering and Construction Division erected the A.E.C.'s Savannah River Atomic Energy Plant in Aiken, S. C.

This plant, a 4½-year task, involves massive equipment, thousands of workers and many different hazards. It is one of the largest and safest construction undertakings in history.

In one period of over 6,000,000 work hours, not a single disabling injury occurred. The safety record achieved at Savannah River was 36 times better than the national average for this type of work.

Of interest to refiners

Many safety problems, similar to those encountered in the oil industry, were solved on this project. "The Builders of Tomorrow" should prove stimulating to engineers, supervisors and others concerned with construction safety. For this reason, the Du Pont Petroleum Chemicals Division has obtained prints of the film. Any sales office will be glad to arrange showings.

Du Pont Lead Hazard Clinic helps promote safe TEL handling through education

Because the dangers inherent in the use of tetraethyl lead are of a serious nature, the Du Pont Company, as supplier of this compound, offers refiners a program to help maintain safe handling operations. Originated in 1951, the program is called the Du Pont Lead Hazard Clinic. A review in January, 1956, showed that Du Pont had presented the clinic 280 times for 44 oil companies before a total audience of 7,787 persons.

Refinery personnel whose work brings them into proximity with TEL learn about the Du Pont Lead-in-Air Analyzer. Slides and booklets help make the Du Pont Lead Hazard Clinic easy to understand.

The clinic is available to all refiners. It is suitable as a refresher course for refinery, marketing, pipeline and terminal supervisory personnel and as a supplement to your own training courses.

Your problems discussed

The six sections of the clinic program cover the toxic properties of TEL, the source of TEL tank cleaning and repair hazards, safe cleaning practices, demonstration of the Du Pont Petroleum Chemicals Division Lead-in-Air Analyzer, a question and answer period, and a summation.

A way of life

Called "Something Else Is Necessary," the summation is delivered by the Petroleum Chemicals Division Medical Director. It emphasizes to the individual his own responsibility in

ADVERTISEMENT—Prepared for the Petroleum Chemicals Division of E. I. du Pont de Nemours & Company (Inc.)

OVER

DU PONT

PETROLEUM CHEMICALS DIVISION
NEWS

DU PONT

CONTINUED **Hazard Clinic**

achieving safe TEL handling . . . in making safety "a way of life."

Experience has shown that the question and answer period offers one especially important benefit to your employees. It gives them a chance to get detailed answers to particular problems from men with extensive experience in every facet of TEL handling.

Visual aids

In easy-to-remember form, a slide presentation shows graphically the safe procedures and recommended precautions for tank entry work. This part of the clinic program is followed by a 5-minute demonstration of the Du Pont Lead-in-Air Analyzer.

A booklet, "Tank Talk," recaps the clinic and a copy is given to each member of the audience. Over 20,000 copies have been distributed and the booklet is now in its third printing.

Available to all

In the interest of sound preventive medicine and good industrial safety practice, Du Pont makes this clinic available to all oil companies. It is recommended for supervisory personnel currently concerned with TEL handling procedures, and to others who may in the future be assigned to this area of operation. To keep their programs up to date, some refiners have set up repeat clinics on an every-other-year basis.

If you would like further information about the Du Pont Lead Hazard Clinic, consult your local Du Pont Petroleum Chemicals Division representative.

HEADS PETROLEUM CHEMICALS DIVISION EASTERN REGIONAL LAB

Ed Jeffus joined the Du Pont Petroleum Chemicals Division in 1950 and was appointed Eastern Regional Laboratory Manager in January 1952. As manager, he works closely with refiners and provides technical services which are directed toward the more efficient utilization of petroleum additives.

Prior to joining Du Pont, Jeffus was a chemist at the Shell Oil Company's refinery at Norco, Louisiana.

His entry into the petroleum industry followed schooling at Magnolia A. & M., Magnolia, Arkansas, M. I. T., and ending with a B. S. in chemistry at the University of Arkansas in 1948. During World War II, he was a meteorologist in the U. S. A. F. and served a 25-month overseas tour in England and France.

Originally from Texarkana, Arkansas, Ed now lives in Wilmington, Delaware with his wife and two children. His hobbies include hunting, fishing, skeet and bridge.

EDISON D. JEFFUS

Mr. Jeffus is a member of the American Chemical Society.

"Speak to the Earth" in Third Edition

Appleton-Century-Crofts, Inc., publishers, have announced a new printing for "Speak to the Earth," a book about the oil industry. The writing of this book was commissioned by the Du Pont Company.

The initial printing was a de luxe edition which was exclusively distributed by the Du Pont Petroleum Chemicals Division. At the same time, a standard edition was produced and marketed to the public by the publisher. This has been sold out.

Of the edition now in printing, 1500 copies will be used by the O.I.I.C. The remainder will be available through regular book stores.

Written by Max Miller, "Speak to the Earth," was first introduced in June, 1955.

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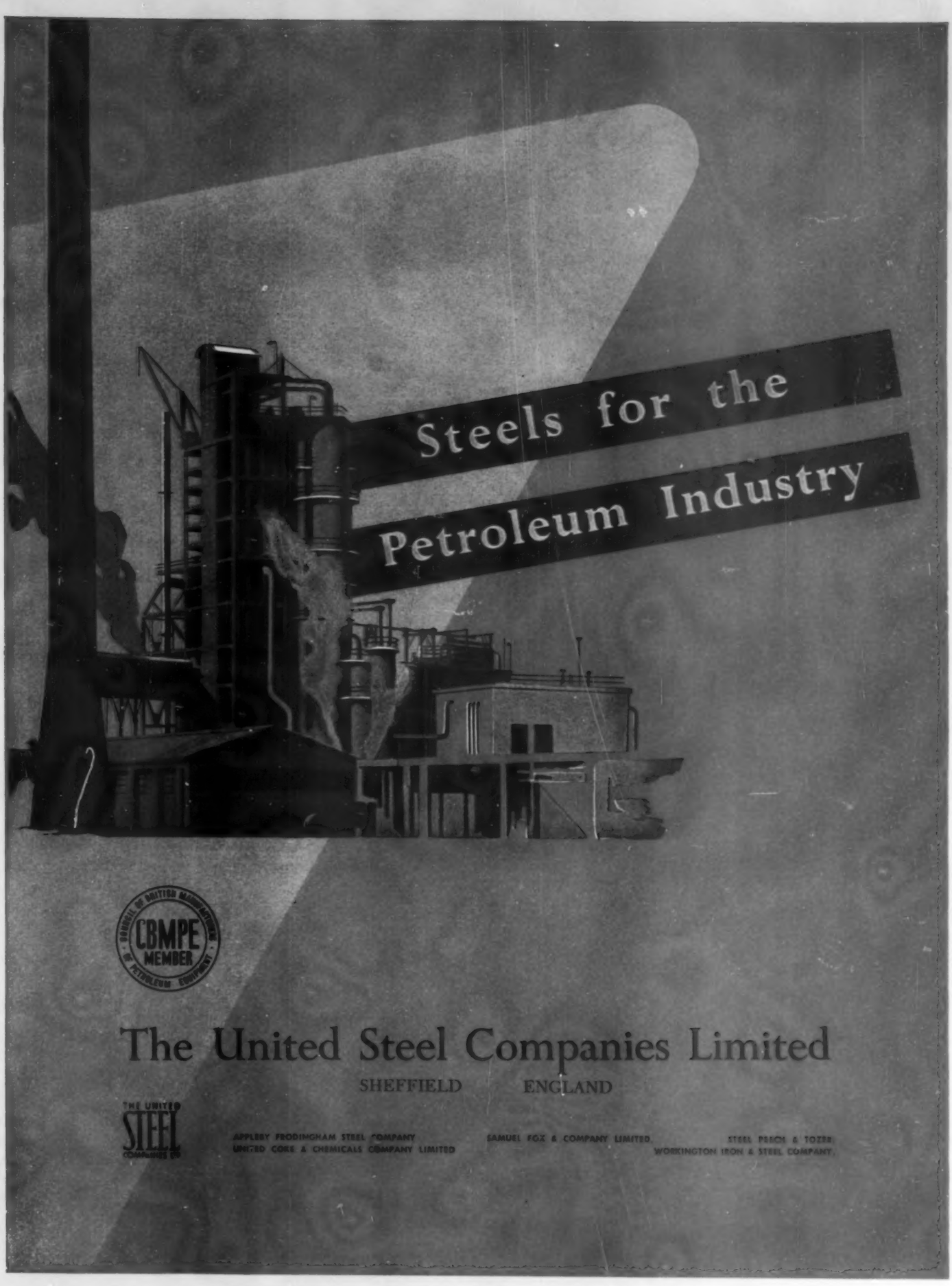
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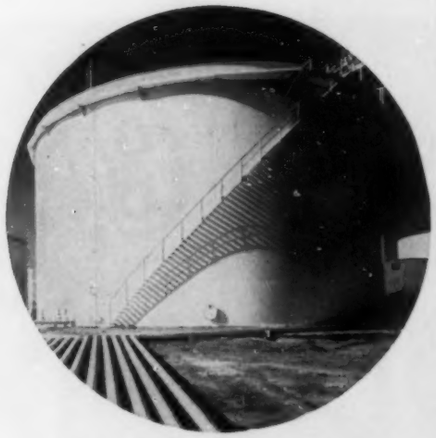

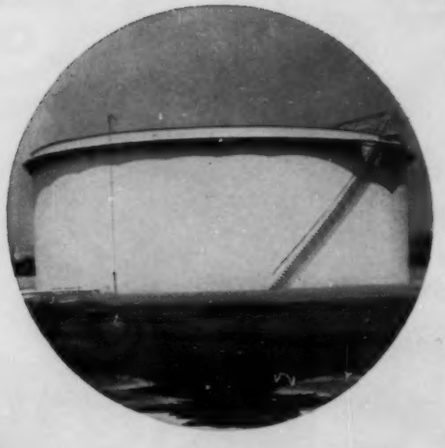

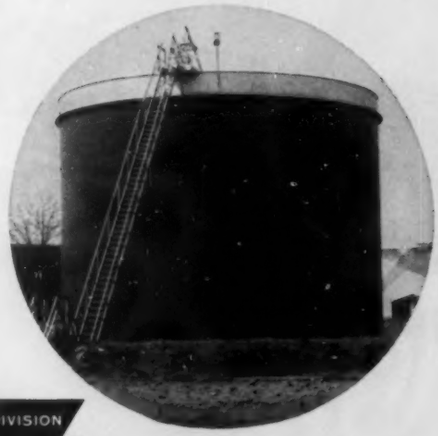

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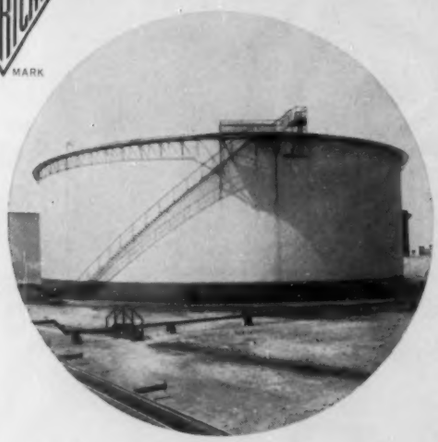

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By GENERAL AMERICAN

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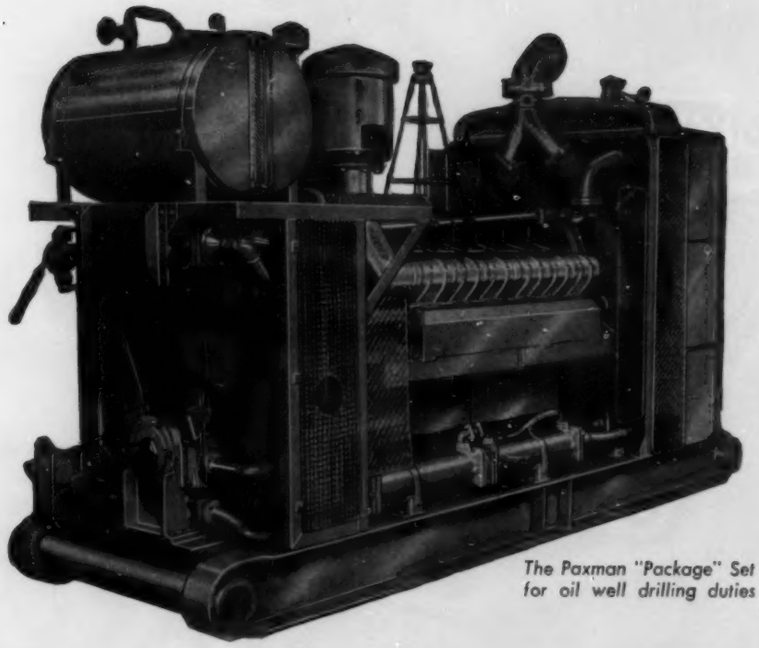

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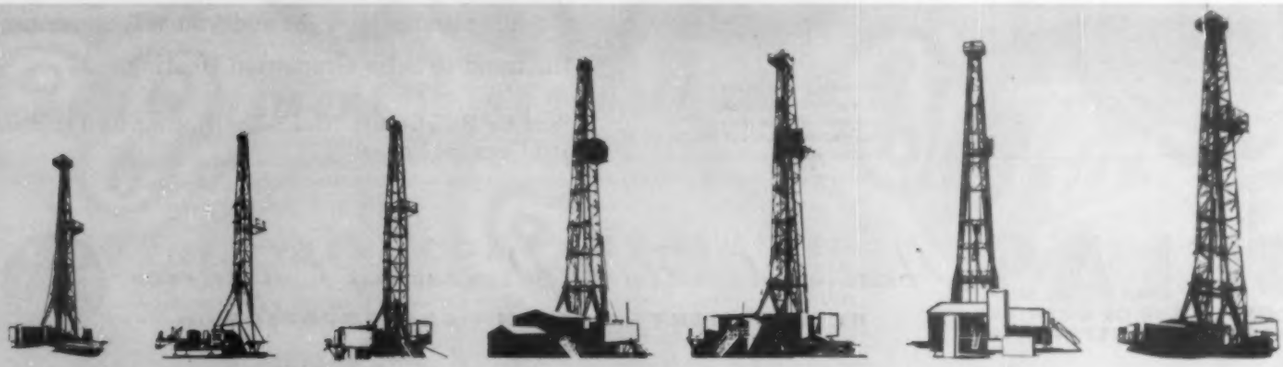

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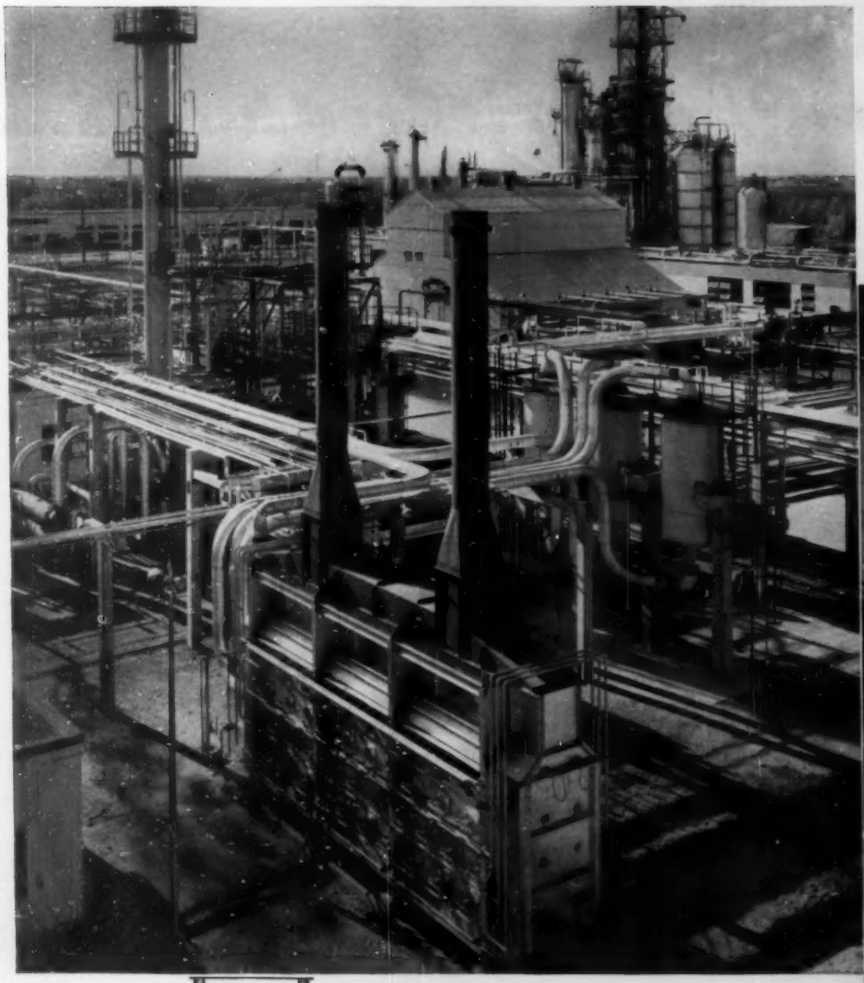

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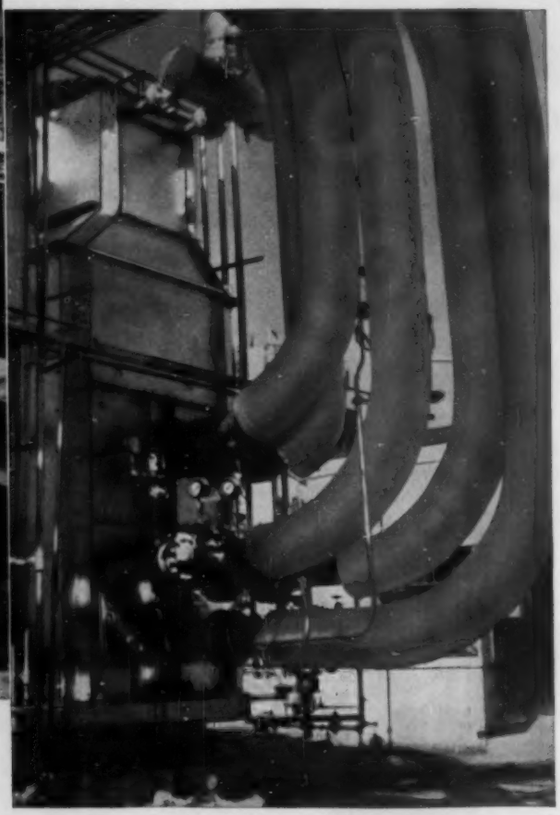

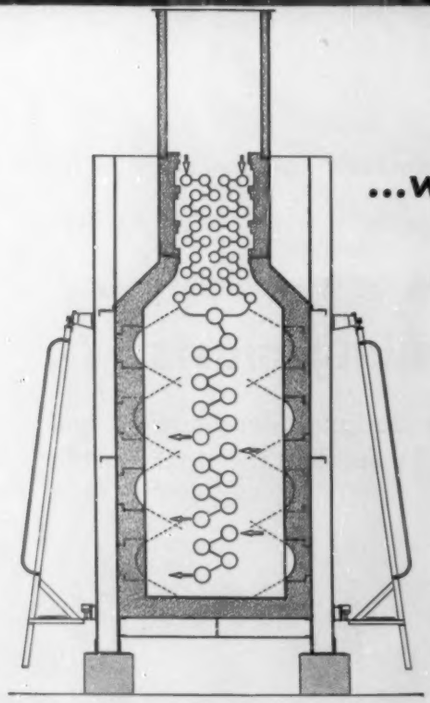

Diagram illustrates the flow of material through the multiple coils during preheat, first and second reheat cycles.

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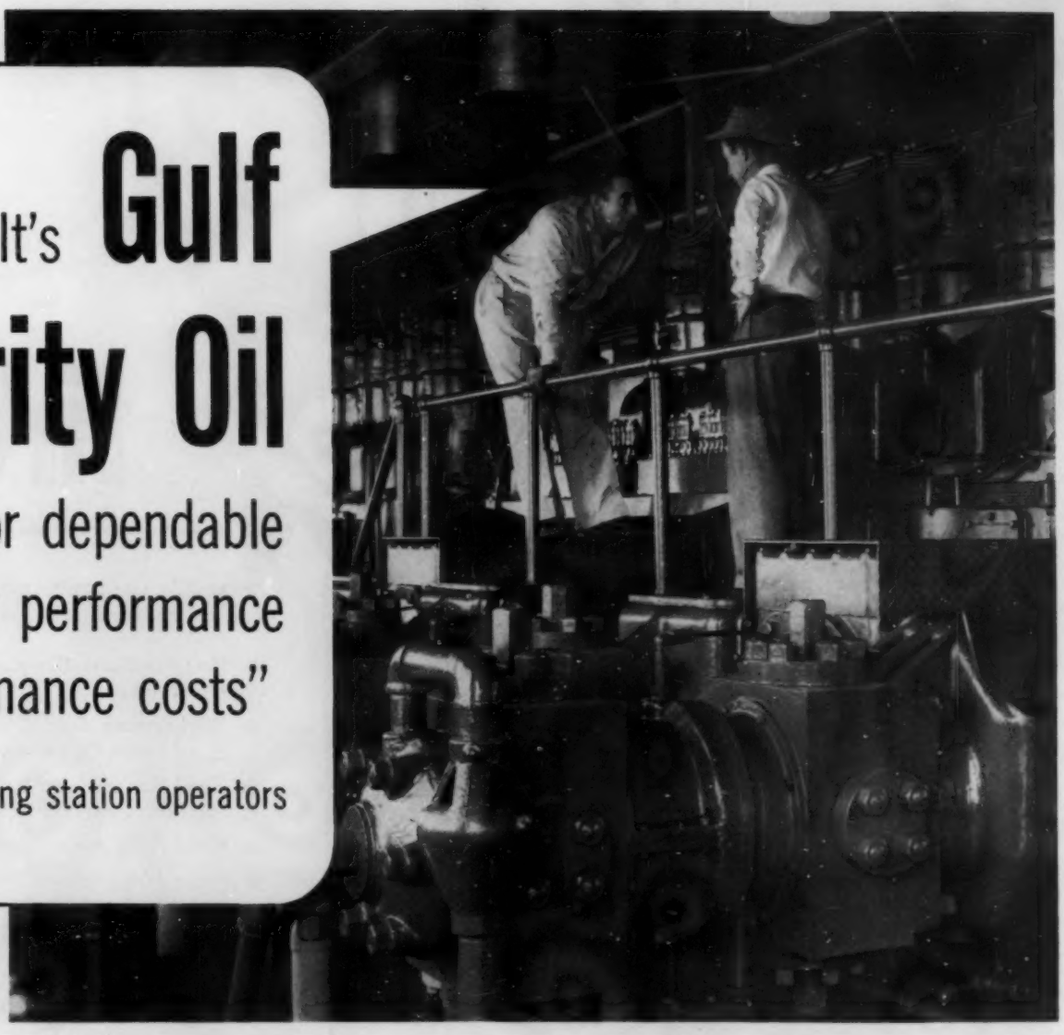
say pumping station operators



Smooth, continuous operation is a must for these units in service at a South Texas gas compressor plant. They are responsible for the steady flow of essential natural gas through pipe lines to homes and industries as far north as Detroit and New York. Gulf Security Oil provides the sure, effective protection needed for cylinders and bearings in both engines and compressors.

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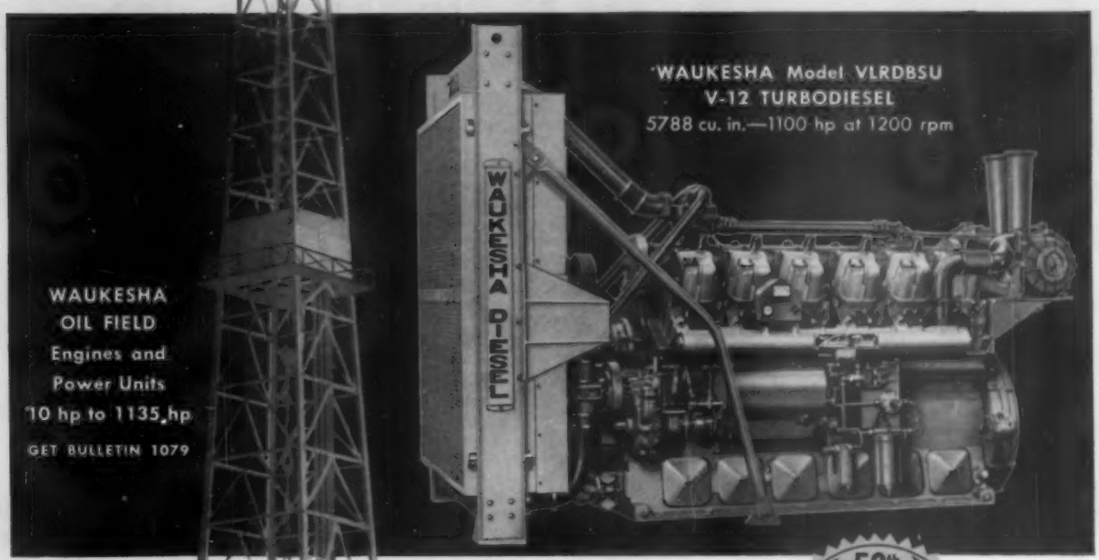

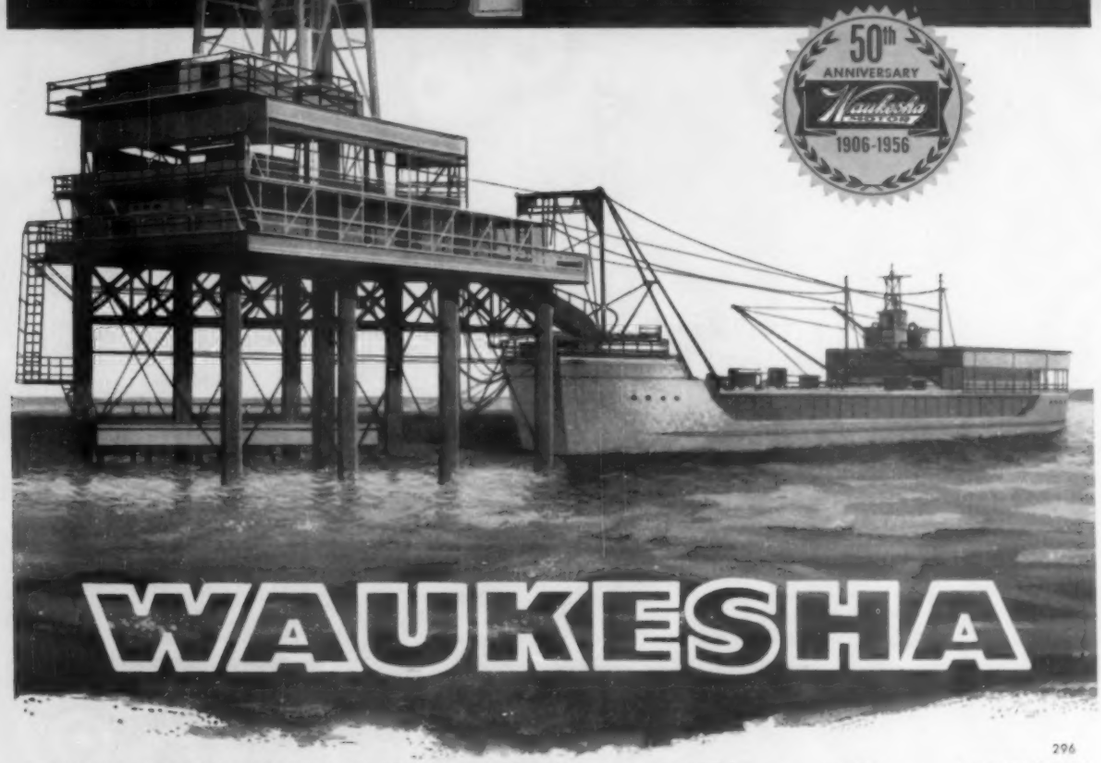

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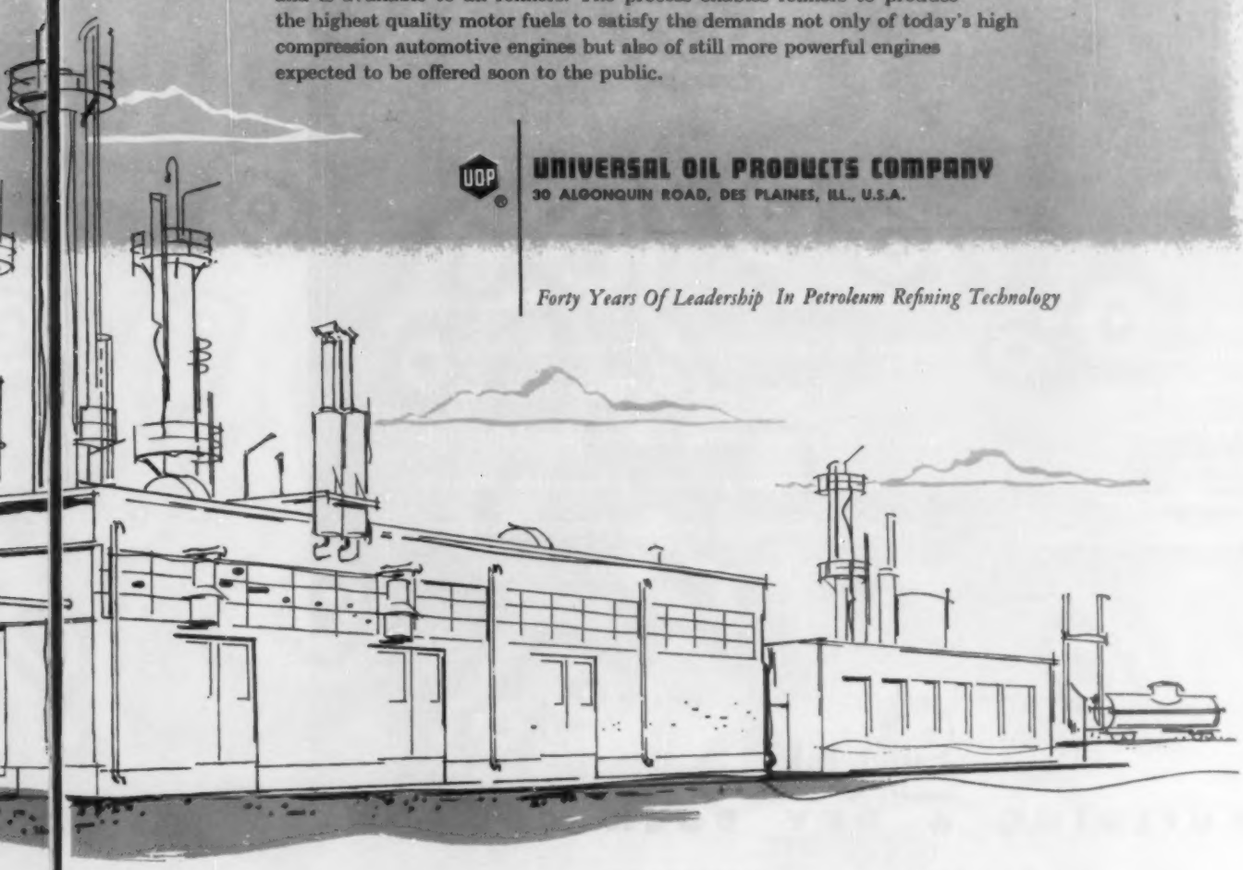
The Rexforming process, capable of producing gasolines having octane ratings well in excess of 100, will enable Cosden to use its UOP Platforming unit, which now produces gasoline blending material, for continuous preparation of aromatic feed stock for a Udex unit.

Rexforming, the latest catalytic reforming process, was developed by Universal and is available to all refiners. The process enables refiners to produce the highest quality motor fuels to satisfy the demands not only of today's high compression automotive engines but also of still more powerful engines expected to be offered soon to the public.



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The M. W. Kellogg Company is privileged to participate in the current expansion program of the Sohio Chemical Company, which provides further evidence of the efficiency of Kellogg's steam-methane reforming process and its unique quench-type reactor. This process is one of four which M. W. Kellogg offers ammonia producers for meeting various local operating conditions. Some idea of the flexibility of ammonia plant design permitted by these four processes, with specific details of each, may be obtained by writing for M. W. Kellogg's 12-page, illustrated booklet, "Synthetic Ammonia—Four Basic Plant Types."

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CHEMICAL PROCESS DIVISION

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A.I.D.D.*

Strong, young business concerns thrive in Saudi Arabia today. Tawif Arabian Company of Dammam is a good example. Hassan bin Bahr Kushaim, center, and Abdullah Nahily, right, owners of this new company, show their crankshaft grinding equipment to William Eltiste of ARAMCO. The Tawif firm is one of hundreds of private businesses guided into existence by ARAMCO's **A**rab **I**ndustrial **D**evelopment **D**epartment.* Coordinator Eltiste heads the A.I.D.D. which supplies advice, technical assistance and encouragement to enterprising Saudis. Ice plants, machine shops, power companies, laundries, taxi fleets are just a few of the many firms that the A.I.D.D. has helped launch.

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DESIGNING ENGINEERS AND CONSTRUCTORS
FOR THE PETROLEUM AND CHEMICAL INDUSTRIES

VOL. 27, NO. 2 FEBRUARY, 1956

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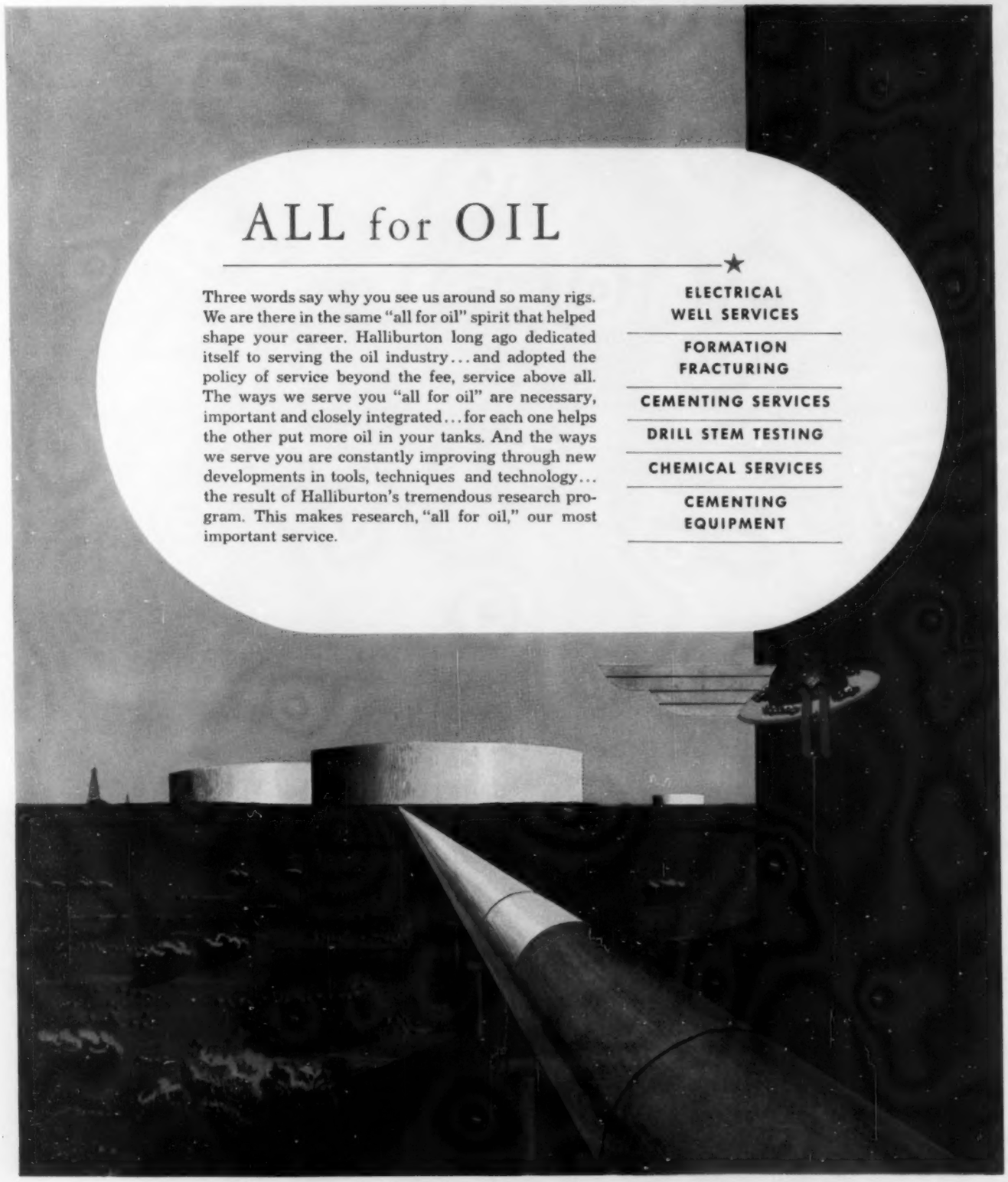
THIS MONTH'S COVER

John Tissavary, art director of WORLD PETROLEUM, has created this impression of light and shadow in an oil tank farm. The study is based on a late afternoon photograph in a Saudi Arabian tank farm of Arabian American Oil Co. originally published in *The Aramco World*.



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PROGRESS IN SERVICE THROUGH RESEARCH

There Is A Limit

MORE intensive and more widespread activity in the search for petroleum is accepted as a certainty for 1956. Appropriations by international oil companies for capital investment are 10 to 15 percent above the estimated expenditures of $5 billion in the past year and plans of lesser companies are for an expansion of their operations.

It is significant that of the projected capital expenditure upward of two-thirds is marked for exploration, drilling and field equipment employed in the search for crude oil, reflecting the industry's recognition of the necessity of energetic action to keep a safe margin of supply between potential production and demand.

In most parts of the world—the noteworthy exception being the United States—all mineral wealth, including petroleum, is held to be the property of the state or of its ruler. On the other hand, most of the oil that has been discovered has been found by individuals or corporations working under concessions from the recognized owners. Over the years the record of governments as operators of petroleum industries has not been outstandingly successful. For one thing, the element of chance in the search for oil is too high to appeal to a state bureau. Another factor is that technical knowledge and training—"know-how" in the language of the industry—are essential to success in finding oil under modern conditions. Whatever the reasons, the fact seems to be that the most successful petroleum enterprises are those in which a private company signs a contract with a state to carry on the search for oil in a specified area, to bear the cost of this preliminary work and, if oil is discovered, to deliver a certain percentage of it to the state as royalty or, alternatively, the equivalent in the form of taxes.

A certain standardized form of agreement covering this relationship has been worked out as the result of experience and is now established in most of the oil producing nations of the free world, including Venezuela and all the countries of the Middle East. The objective of the agreement is to provide an equal division of profits, if profit there shall be, between the state as owner of the property and the company as manager and operator. A number of countries have revised their petroleum laws in the past few years to make them conform to this modern standard and to remove restrictions that interfered with its acceptance as a fair basis for operation. Among these are Peru, Bolivia and Guatemala in Latin America, Libya and Turkey in the Near East. All of these countries recently have granted concessions to private companies which will extend systematic search for oil to areas previously unexplored.

Companies that are equipped for international operations are prepared to risk sums that may run to hundreds of millions of dollars in the exploration and testing of areas that have revealed substantial possibilities of containing oil in commercial quantities, and they do this in the full knowledge that if the region proves to be barren the whole expenditure must be written off as a loss—their loss.

These companies are operated in the hope of profit and if they are denied freedom of action in marketing the oil produced by their efforts, or are faced by other charges that would greatly reduce the returns from their nominal 50 percent share of production, they regard it as a venture too doubtful of paying out its costs and yielding an ultimate profit to make it an inviting undertaking.

This is the condition that is said to restrain these companies from applying for concessions in Italy, where discussion of this question of government terms has arisen in connection with the proposed revision of the petroleum law, which the Italian government offers as a means of enabling foreign companies to participate in the development of the country's oil resources. Critics of the measure point out that it violates the equal division of profits by stipulating that 60 percent of proceeds from the sale of oil must be turned over to the government, while the 40 percent remaining of the company's share will be subject to Italian income taxes. Other regulations included in the projected measure are opposed as too restrictive but the financial requirements alone are held to make successful operation impossible for a concessionaire no matter how prolific a discovery may prove to be, and this is held to explain the lack of interest shown by international companies in the government's proposal.

This question is one that was certain to arise sooner or later in view of governmental appetites for more and more revenue from petroleum taxation.

In the opinion of the best informed men in the oil industry, it appears that the present 50-50 division of profits after preliminary development expenses have been repaid is the best that the industry can offer and remain solvent. And since operating costs are steadily rising, conditions in this respect are not likely to improve in the future.

Creole Petroleum Corporation increases materials handled 350 percent with a reduction of 27 percent in manpower through modernized equipment and employee training.

Mechanized Equipment Handling Pays Off

A fork-lift truck deposits a load of creosoted lumber in the outside storage yard of Creole Petroleum Corporation's La Salina, Venezuela industrial base. Extensive use of the fork-lift truck is one of the main features of the new handling program.

Jack N. Ward, author of the accompanying article, is now Materials Coordinator for Creole Petroleum Corp. He was stationed at La Salina from September 1949 to January 1953, and as warehouseman and materials administrator for the area played an important part in the program that the article describes. Mr. Ward joined Creole in 1947 and spent two years in eastern Venezuela, at Jusepin, before going to Lake Maracaibo. In January 1953 he was sent to Creole's big refinery at Amuay on the Paraguana peninsula and in November of last year was transferred to his present job in Caracas. Mr. Ward himself took the pictures used to illustrate the article.

By Jack N. Ward

A BASIC REORGANIZATION of the materials handling and warehousing system at its sprawling industrial base at La Salina by Creole Petroleum Corp. has resulted in more efficient work methods, a sharp reeducation in costs and a substantially lower work force to handle an increased volume of material. The reorganization program, which is now bearing fruits, is the result of a series of studies begun in January, 1948. These studies and the steps taken to put their findings into effect covered a period of six years, with the over-all program being carried out on a gradual basis.

It is felt that the methods, equipment and procedures in use as a result of the program ensure that there need be no major changes or revision in equipment or methods for a number of years to come.

La Salina is the industrial backbone of all of Creole's oil-producing operations in the Lake Maracaibo area. The magnitude of these operations is indicated by the fact that approximately 80 percent of Creole oil is produced from the lake area and Creole-Venezuelan affiliate of Standard Oil Co. (N.J.) is the biggest of the 15 oil companies now operating in Venezulea. In the first ten months of 1955, Creole's daily production average for all its operations was more than 950,000 barrels.

In the reorganization process at La Salina, the district was converted from its combined drilling-producing-service func-

A before-and-after comparison of a part of Creole's outside storage facilities at La Salina. The picture to the left shows the storage yard as it was in 1952 before the area was paved and reorganized, the oil derrick in the background in both pictures being a point of reference.

tions to the role of an industrial service base only. It is now the servicing area for all mechanical maintenance, materials and supplies, transportation and other housekeeping functions necessary to keep the huge daily production of the entire lake area going.

In addition, the handling and storage of oil country tubular goods was concentrated at Tía Juana, 11 miles downshore from La Salina, and the work methods of this handling procedure also were reorganized under the general program. Although this function is properly a part of La Salina materials operation, is was decided to make Tía Juana the handling point for oil country tubular goods because all lake area drilling operations are headquartered at the latter point. The handling operations there were one of the first phases of materials operations in general to be completely mechanized under the broad reorganization program.

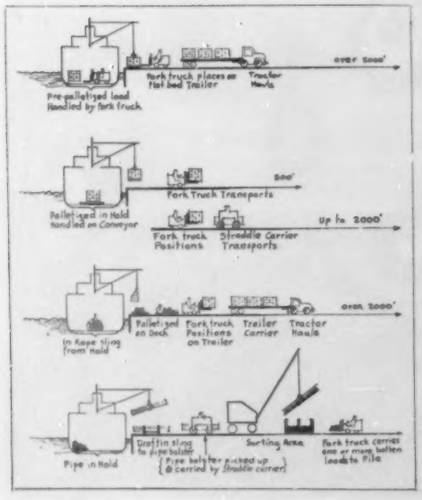
In the over-all picture, the part played by the Materials Group is a highly important one. It affects all purchasing, receiving storing and issuing of materials, supplies and equipment for the Bolivar Coastal Fields and the Mara (Maracaibo) area. This area extends from the city of Maracaibo on the west side of the lake across to the installations on the east shore, which extend down 60 kilometers to the area of Bachaquero.

The first step toward the reorganization program was taken in January, 1948, when Creole decided that its warehousing and materials handling methods were lagging behind the techniques employed in other phases of its operations. A consulting engineer firm was employed to make a detailed study of facilities and of work methods.

After the first survey had been completed and its results analyzed, a second

The picture to the left of drums of motor oil and lubricants shows how this material was handled prior to the reorganization of La Salina and the picture to the right shows the current system of storing.

Fork truck is shown lifting a load of 5½-inch casing at Creole's oil country tubular storage yard at Tia Juana 11 miles down the lake shore from La Salina. One of the innovations adopted was placement of battens between tiers of stored goods to facilitate handling.



survey was ordered in November, 1948. This study embraced the entire industrial modernization program, including both warehousing and materials handling and the steps needed to put such a program into effect. Its recommendations were accepted and the planning necessary to implement them was started at once.

Work on the program was begun in 1949, but was suspended until late 1950, at which time activities were resumed with the paving of the entire industrial area some 330,000 square meters—begun, this task, necessarily a slow one because it had to be done without interrupting normal activities of the base, was continued through 1951 and completed in 1953. The cargo pier where materials and equipment are received also was widened from 10 to 33 meters to make handling operations more efficient and to permit the use of heavy mobile equipment that was called for by the program.

During this period the volume of freight handled over the pier reached a peak volume of 87,000 tons per year. In the first three months of 1951, by which time a part of the program had been put into effect, the tonnage handled equalled the total amount handled during the entire year of 1950, with no increase in personnel.

Some modifications in the original reorganization plans were made as the work of implementing it went along. For example, in 1951 it was decided to design mechanized equipment for materials handling around a trackless train, but it was

later concluded that the use of a trackless train would not be practicable. However, the fork trucks, straddle carriers and other mechanized equipment included in the original scheme were purchased as planned.

A third survey, more comprehensive than the first two, was decided on early in 1952 after the materials situation had been reviewed again, and another consulting firm was called in to carry out this study. It resulted in the methods and equipment in use today.

In order to carry out the huge reorganization job (average monthly issues from the warehouse at La Salina have been slightly over $2 million per month since the latter part of 1952), the following problems had to be faced and overcome:

1. Modernization of the thinking of the men who carried out the operations, to make them "mechanization-conscious."
2. Modernization and mechanization of handling.
3. Development of the most practical type of equipment to operate on a sand-asphalt type of paving, capable of moving a large volume of materials of all classes.
4. Training of personnel in the use of equipment and methods adopted.
5. Showing a pay-out for the large expenditures involved.

The first problem listed was the most difficult of solution. From management down to laborers, it was necessary to do a "selling" job. This was achieved through training films, meetings and a manual that showed clearly the advantages of the new system. The opposition to the program stemmed chiefly from the basic human trait of resistance to any change from long-established custom, but it was eventually overcome.

After items 1 and 2 had been disposed of, it was decided to replace the railway system, formerly used, with the following equipment: straddle carriers, fork-lift trucks, platform trucks and mobile cranes. Equally important, from the point of view of efficient handling, was the decision to pallet-ize all piling and storing operations in the area. Some 7,500 pallets of varying sizes were included in the initial order of this phase of the program, and additional large quantities were acquired later.

The training of personnel ranged from the laborer to first-line supervisors and consisted chiefly of on-the-job instruction. Covering a period of about six weeks, it involved actual using of new equipment and methods. It is worthy of note that during this training period, the trainees themselves originated new ideas or suggested new work methods.

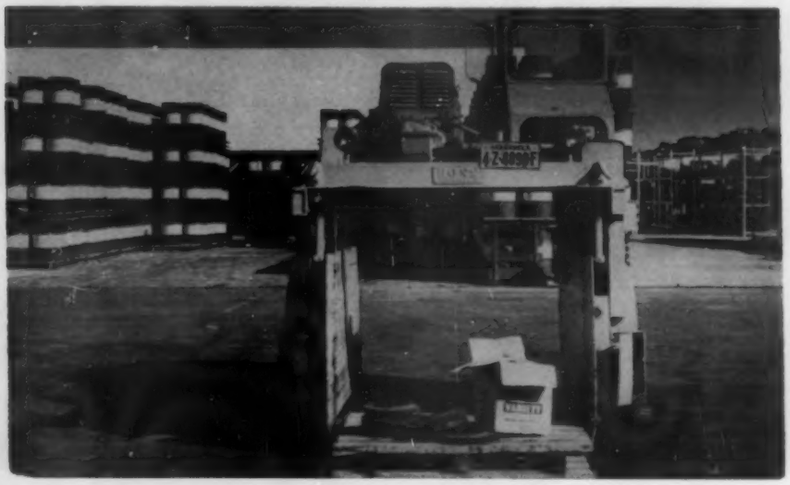
The pay-out of the mechanization and modernization of the Materials Group alone may be used as a yardstick for comparision of cost reduction in the other servicing groups.

In 1954 the Materials Group handled three and one-half times as many tons of material and equipment as in 1950, with a 27 percent reduction of personnel, giving concrete proof of the economics of such a modernization program.

Furthermore, one large warehouse at Lagunillas, on the lake shore, and a smaller warehouse at Mara were eliminated.

To make sure that equipment and work methods keep abreast of the most modern and efficient developments in the future, an industrial engineer has been added in each central Material organization as well as in the general engineering organization.

A straddle carrier is preparing to move a small palletized load. Lifting and carrying of material, particularly tubing and casing and bar goods, is now done largely by these straddle carriers, which move into position over the article to be moved, lift it and move away with it.



Formerly unloaded and racked at La Salina, these goods are now unloaded from shipboard to barge and taken directly to Tia Juana.

SHELL'S aid to Venezuelan farmers

With a population of about 6,000,000 only about 4.9 million acres are under cultivation in Venezuela. This is only 2.2 percent of the total land area and a minor fraction of the total arable land.

Population of the country has been growing rapidly, but interest has centered in the development of mineral resources rather than in agriculture. As a result, Venezuela no longer is net exporter of such products as sugar, meat and corn as was the case some years ago.

Taking a broad view of its responsibilities, Cia. Shell de Venezuela, the second largest oil producer in the country, has been going ahead since 1952 in a program of research to raise agricultural production.

In an effort to raise food production per acre Shell set up Shell Agricultural Service knows as Servicio Shell Para El Agricultor in 1952 and since that time has been carrying out a little noticed but fundamental program of research and advice. The service is free and impartial, conducted under Dr. Mauricio Baez, director, who is a native Venezuelan. An experimental station was constructed in the fertile valleys of Aragua, one of Venezuela's best agricultural districts. There 100 acres of experimental crops are grown in a search for new varieties suitable to Venezuela conditions.

Activities are not confined to experimental crops, however. Shell makes sure that the results are spread to the farmers themselves with bulletins, monthly newsletters, demonstrations and about 2,000 individual visits to farmers in 1954. A constant program of research is carried on as well, with groups of specialists engaged in sections devoted to Agronomy, Entomology, Phytopathology, and Agricultural Engineering.

The Phytopathology section is concerned with diseases of plants. To date it has confined its activities to more common infections of local crops. It has been found possible, however, to control successfully the fungus infections of potato plants so they can be produced during the rainy season. At present Venezuela imports about 45,000 tons of potatoes. The picture shows spraying of peppers which to date are produced only in the dry season, but are experimentally being grown under wet conditions.

Shell works in close cooperation with local spraying contractors. Shown is a sugar plantation being treated with insecticide. Although Shell insecticides may be used, those of other manufacturers are tested and recommended if proved suitable.

Visits are made by trained personnel with farmers, as shown below, discussing problems and offering information obtained in research.

The Etymological section works on control of insect pests. Shown are squash plants being dusted with insecticide to determine proper strength of spray, etc.

In the relatively short time during which the service has been established, inquiry has shown that there are many important crop production problems in Venezuela, the solution of which could lead to higher yields and better quality produce. The service has already demonstrated that the control of a number of insects and plant diseases of substantial economic importance attacking crops such as cotton, rice and maize is not only possible but is relatively simple and inexpensive. Further, by a combination of weed and fungus disease control the service has shown that crops such as potatoes, hitherto grown only in the dry season and under irrigation, can now be grown successfully and more cheaply in the wet season.

Coupled with this, the service has introduced and adapted special farm equipment such as sprayers, planters and harvesters which are simple and efficient and the use of which by the farmer can be highly profitable.

New varieties of existing crops which are now undergoing trial by the service may prove to be valuable additions to those already grown in the country.

The results obtained by the work described above, written up in a simple manner, are widely circulated among farmers, and the knowledge gained by the work of the service is spread by farm demonstrations and by many farm visits.

In addition, several short instructional films are in preparation which will illustrate new or improved farming techniques. The beneficial results of the work of the service are already apparent, and have brought highly favorable comment from Venezuelan farmers and others connected with the business of crop production.

The picture shows the Agricultural Engineering section where an experimental irrigation canal has been built as part of the study of drainage and water supply.

A. G. Moreton is a native of Windsor, Ontario. He graduated from Queen's University in 1943 and entered the Royal Canadian Air Forces as a navigation instructor. During service in England a year was spent on paint research in the Slough plant of Imperial Chemical Industries. With the aid of a fellowship the author returned to Queen's University for graduate work in science. From 1947 to 1955 he was employed by Imperial Oil Ltd. as a process design engineer. Among other projects he was in charge of a group involved in detailed process design of a number of the Edmonton lube units. In 1955 he was transferred to Edmonton on startup work involving the lube plant and in October became technical superintendent at the refinery.

PRAIRIE LUBE PLANT

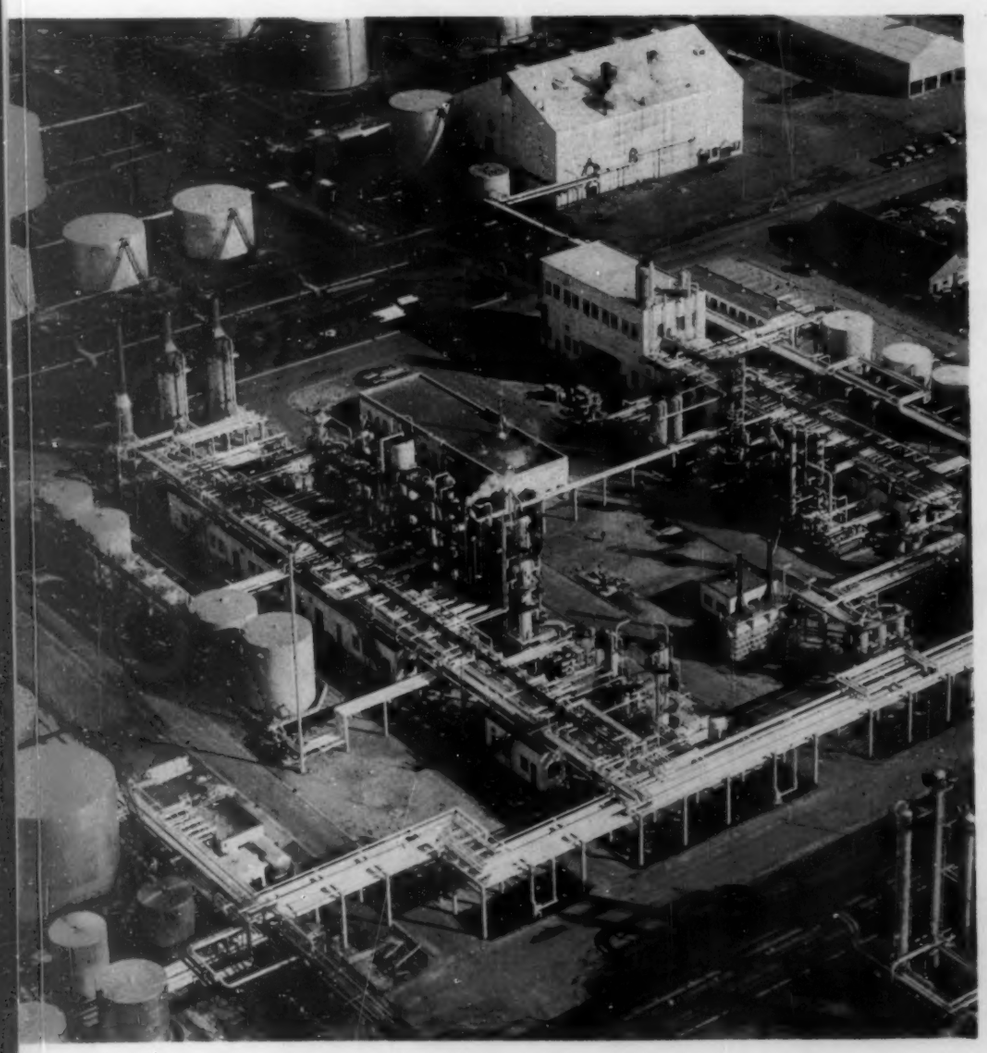
Canada's first lubricating oil refinery on the western prairies has been built by Imperial Oil Limited at its Edmonton, Alberta works. Included in the plant is a unit for mild hydrofining to ensure uniformity of base stock qualities. A higher ketone process developed by Imperial is used to dewax the 110°F pour point Leduc blue distillates.

By A. G. Moreton

SINCE the discovery of the Leduc field in Western Canada in February 1947 the proven reserves of oil in this area have grown steadily. In contemplation of large reserves being established research work was immediately initiated by Imperial to analyze the product potential of the various types of crude oil produced. One of the prime objectives of this work was to classify the crudes as to their potentialities as lube crudes. From this work it became apparent that a number of crudes could successfully be used to manufacture high quality lubricating oils. Among the best of these was Leduc-Woodbend crude oil.

Canada's rapid economic growth in the postwar period made itself apparent in Imperial's lubricating oil business. To meet rising demand expanded manufacturing facilities were required. With the advent of suitable crudes in western Canada and an increased demand in this area, it was decided that expansion of lube producing facilities should be by construction of a new plant at the Edmonton refinery rather than expansion of existing facilities at Sarnia.

Since the Leduc field is only a few miles from the Edmonton refinery and the crude is a very suitable source of lube distillates, design of the lube units was based on this crude. It has long been Imperial's practice to manufacture lubricating oils from narrow cut distillates without bright stocks in order to produce top performing products. To produce these distillates a vacuum dis-



Aerial view of new Edmonton lube plant of Imperial Oil Ltd. showing compact grouping of component units. Photo by Elwood Payne for The M. W. Kellogg Co.

The phenol treating unit from the dewaxing plant tower structure. Photo by Elwood Payne for The M. W. Kellogg Co.

tillation unit was required as a first step towards lubricating oil manufacture.

The second step in the process involves the removal of low quality components inherent in the distillates. Commonly used processes for removal of these aromatic type components are furfural and phenol extraction. Imperial's original development of, and 25-year association with the phenol extraction process along with other factors involving process control, product quality and cost of construction and operation dictated choice of this process as a second step in lube manufacture.

Since the Leduc distillates contain appreciable waxy material which gives them a pour point in the neighborhood of 110°F it was necesary to provide a third step in manufacture to remove the waxes and produce lube stocks with suitable pour points. For this purpose a higher ketone process on which Imperial has done a great deal of exploration, research and development was adopted and the design of the dewaxing facilities was based on this process.

A finishing step was incorporated into the plans to ensure uniformity of base stock qualities such as color, color stability, odor, demulsibility, neutralization value, carbon residue, oxidation stability and response to additives. Some years prior to the decision to build lube facilities at Edmonton, Imperial's research department had shown that a special type of mild hydrofining allowed very flexible control of the above-mentioned properties. On the basis of their studies a 600 b/sd unit was constructed at Sarina for finishing turbine oils, transformer oil and waxes. Operating data from this plant was available in time to confirm that this was a practical finishing method which showed economic advantages over conventional methods. Hydrogen supply was provided by incorporation of a catalytic reforming unit. This unit was justified on the basis of future octane requirements.

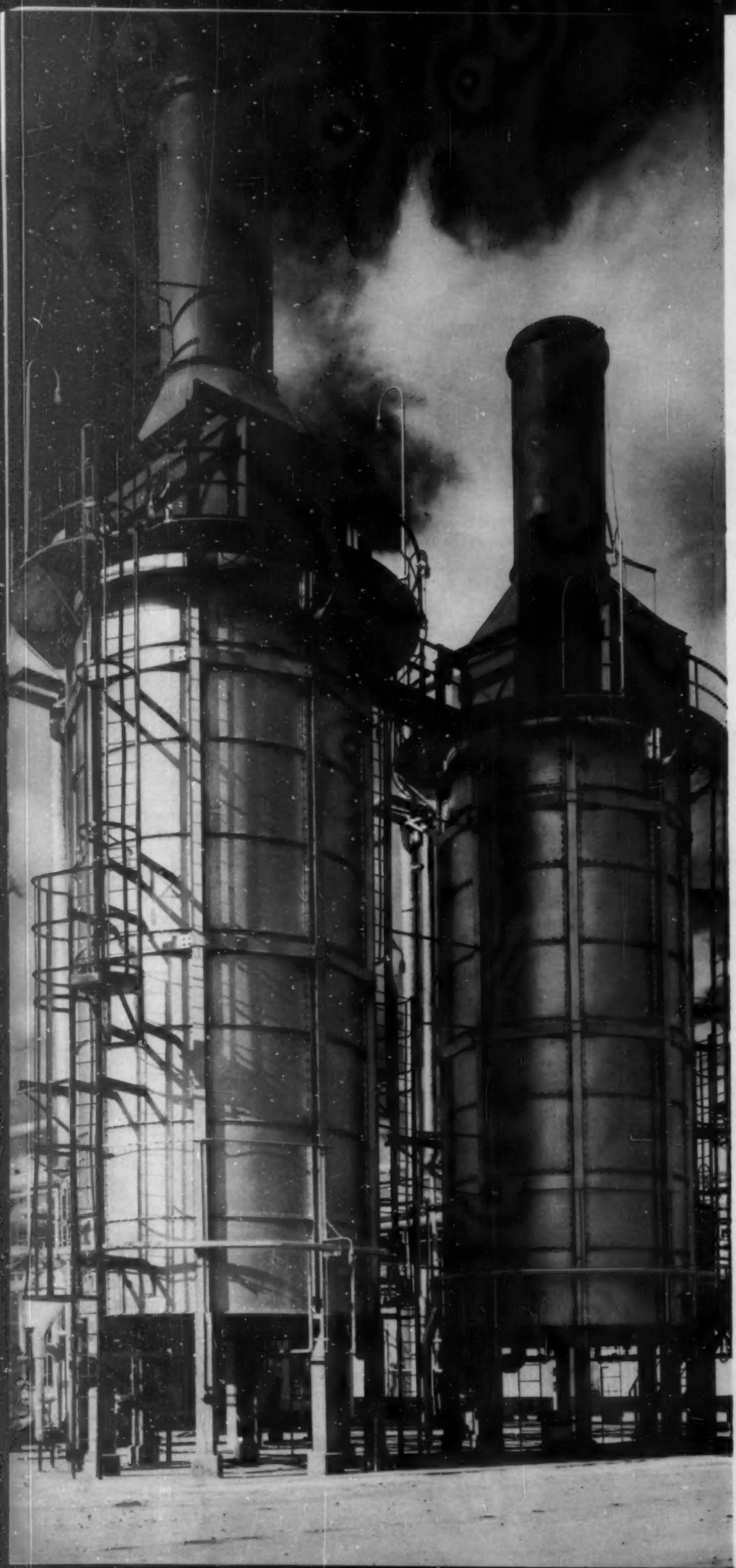
Finished base oils produced in the preceding steps required blending and the addition of additives to produce the many grades of lubricating oil to be supplied. After consideration of many blending methods the decision was reached to build facilities for both automatic and batch blending of the oils. Following blending, facilities were provided for the automatic packaging of the oils, storage in a large warehouse or in tankage and shipment to the customer.

The research back of the processing sequence chosen, and shown in Figure 1, was for the most part carried out by Imperial at Sarnia with the aid of the facilities of the Esso Research and Engineering Co. Detailed process and general mechanical design was carried out by Imperial's engineering division in Sarnia. The detailed mechanical design and construction was by the Canadian Kellogg Company.

Before detailed designs were initiated a study of the overall plant operation was made. As a result of these studies it was decided to run the three major lube units, phenol treating, solvent dewaxing, and hydrofining as an integrated operation with no operating tankage between units. For smoothing minor process upsets surge capacity between units and sections of units was to be provided. As well, since the units were to run in step, slightly larger units were required than would have been the case had intermediate tankage been provided. The extra unit capacity was readily justified by tankage savings. Steam sparing and other provisions for operation on power failure were also extensively studied so that the effect of such failure on the integrated units would be minimized. For use during turnaround periods limited tankage was provided between each of these units.

Studies during detailed design prompted investigation of a circulating hot oil system to supply process heat to the reboilers. Due to the high temperature levels involved, normal petroleum base oils were of unsatisfactory stability and the final comparison rested betwen a circulating Dowtherm A system and the use of a multitude of small fired heaters for each duty. The studies revealed cost and operating savings for the circulating liquid Dowtherm system. Other advantages lay in the gentler treatment of the oil, because of lower oil skin temperatures, and the ease of operation expected for this system. As a result a circulating Dowtherm A system was designed.

The vacuum distillation unit had previously been engineered by Foster Wheeler Corporation to Imperial's design as a feed preparation unit producing vacuum gas oil for feed to the catalytic cracking unit. To convert the unit to supply suitable lube distillates required only the addition of fractionating trays, strippers and attendant handling facilities, since the original design had contemplated future lube manufacture. The unit feed consists of 36 percent reduced Leduc crude produced at the refinery's two pipe stills. The major unit operation produces light, intermediate and heavy lube distillates for production of finished base stocks of SAE 10, 30 and 60 viscosity. A lighter gas oil is also produced as catalytic cracking unit feed. An alternate operation will permit production of a light dis-



tillate for manufacture of an SAE 5 base oil. Table I shows design yields for this unit.

TABLE I
VACUUM DISTILLATION UNIT
DESIGN YIELDS

	Saybolt Viscosity		
	100°F	*210°F*	*Vol.%*
Charge 36% Red. Leduc Crude			100
Vacuum Gas Oil	50-100		19.4
Light Lube Distillate	160-170		30.6
Intermediate Lube Distillate		77-82	28.3
Heavy Lube Distillate		180-190	7.8
Vacuum Pitch			13.9

Feed to the unit is brought in hot from the pipe stills to a surge drum. The feed is then pumped through the heater to the vacuum distillation tower where conventional means are used to produce the three stripped lube distillates and a light vacuum gas oil as sidestreams. Overhead vapors consisting mostly of steam are condensed in a surface condenser. The condensed material is settled and the water and oil phases are disposed of suitably. Two stage steam ejectors take suction on the surface condenser to produce vacuum.

The three lube distillates are sent as required to storage tanks in the lube area. Surplus oil is used as catalytic cracking unit feed. From the storage tanks the feed stocks are processed in blocked operation through the lube units.

The phenol extraction process for lube treating was originated by Imperial (1) and has been used for many years as one step in the manufacture of premium lube oils. During the past eight years intensive research has resulted in marked improvement in the operation of the process. For the most part work has been aimed at improving the efficiency and operability of the phenol treating tower proper. As a result of cooperative studies between the Esso Research and Engineering Company and Imperial's research department markedly improved tray designs were developed. These trays have greatly reduced plate to plate entrainments and have minimized settling difficulties. The improvements have resulted in at least doubling the tray efficiencies as well as increasing tower capacity. Tray designs developed in these studies were used for the new tower at Edmonton. Co-incident with the tray development work a very satisfactory conductivity type instrument was developed for interface measurement. The installation was later adapted for automatic level control of phenol-oil interfaces and incorporated in the Edmonton design. The measuring lements of this device consist of two electrodes. One electrode is inserted at 45° to the vertical and projects through the interface. The resistance across the electrode is a measure of the position of the interface on the electrode. A second hori-

Dowtherm heaters with the phenolic water incinerator on the right. Photo courtesy of Imperial Oil Ltd.

zontal compensating electrode is immersed in the phenol phase to corect for varying conductance of this phase. A wheatstone bridge measures resistance and the reading can be correlated to interface position for level indication and control.

The extraction process is conducted with a continuous phenol phase in an 11-foot diameter tower containing 16 single-pass trays. Spent phenol is flow controlled out of the bottom of the tower and fresh phenol injected at the top by level control of the interface in the top surge chamber. The temperature of the process and temperature gradient in the tower are controlled by the temperature of the phenol and oil feeds to the tower. As a further aid in obtaining optimum operation, water may be injected into the tower at various points. Injection of water permits control of oil solubility in phenol thereby aiding in control of emulsions and in adjustment of selectivity within the tower. The prime variables for obtaining the correct viscosity index oil are percent treat and temperature with water injection giving an additional, though secondary, control variable. Table II lists the design yields for the principal Edmonton distillates.

TABLE II
PHENOL TREATING UNIT
DESIGN CONDITIONS

	Feed Rate B/SD	*Yield*	*Dewaxed V.I.*
Light Lube Distillate	4 839	69	90
Intermediate Lube Distillate	4 005	64	90
Heavy Lube Distillate	3 383	60	90

Feed oil is pumped from tankage, heated to the correct temperature, and fed to the treating tower where it is contacted with phenol flowing downward over the trays. The raffinate is recovered by two stage vacuum distillation system. In the first vacuum stage heat is supplied to the raffinate in a Dowtherm heated reboiler. The phenol vapors generated are condensed and pumped to tankage. Residual phenol is steam stripped from the treated oil before it flows to the Dewaxing unit.

Spent phenol from the tower is cooled and settled and the oil phase returned to the tower. The remaining spent phenol stream is sent to tankage for feed to a three stage recovery system. Overhead phenol and water vapors from the first recovery stage enter a dehydrator tower where dry phenol is taken as a bottom product and phenolic water as overhead. This phenolic water circulates to the treating tower. As water builds up in the system it may be disposed of by passing some of the overhead vapors from the dehydrator through an absorber where part of the untreated oil feed is used to absorb the phenol.

The bottoms from the atmospheric stage are further heated and flashed in a high pressure stage prior to final phenol removal by steam stripping. Heat for the process is again supplied by circulating Dowtherm.

To ensure long life of the equipment extensive use was made of steel alloys and brass to reduce corrosion in critical locations such as with phenolic water, wet phenol and high temperature phenol streams.

Solvent dewaxing has been used by Imperial for over 15 years. Operations have not been carried out using the dual solvent MEK-benzene (or toluene) method but have been confined to use of single ketones such as diethyl, methyl n.propyl and methyl n.butyl ketone. The use of these solvents has been covered by Tiedje and MacLeod (2) and the advantages of higher ketones summarized. Due to solvent price considerations operations at Edmonton will begin with methyl iso-butyl ketone even though it gives about 30 percent lower filtering rates than diethyl or methyl n.propyl ketone. It is believed that no other plants have been designed to use this solvent.

Except for the solvent used the plant employs fairly standard dewaxing techniques. Six 875 square foot scraped surface double pipe exchangers are used to cool the charge mixture and three 875 square foot shell and tube scraped surface units are used to chill the feed to the filtering temperature by use of propane refrigerant. The refrigeration system with a capacity of 320 tons at −25°F employs two two-stage gas engine driven compressors, each capable of handling 75 percent of the load at the design temperature. Refrigerant is distributed to the users at about −50°F.

Primary filteration is accomplished by three 400 sq. ft. rotary solvent dewaxing filters. Slack wax from the primaries is further de-oiled on a fourth 400 sq. ft. de-oiling filter. The vacuum filters, constructed to Imperial's requirements, are of special design to permit use of newly developed filtering techniques. Flue gas facilities have been provided for blanketing of the filtration equipment and other solvent containing vessels.

Recovery of the solvent from the dewaxed oil is accomplished in three stages employing double effect evaporation followed by atmospheric steam stripping. Reboiler heat is again supplied by circulating Dowtherm. Wet solvent is dried by azeotropic distillation in order to hold the water content of the circulating solvent low enough so that oil solvent miscibility characteristics will be satisfactory and so that corrosion of equipment will be eliminated.

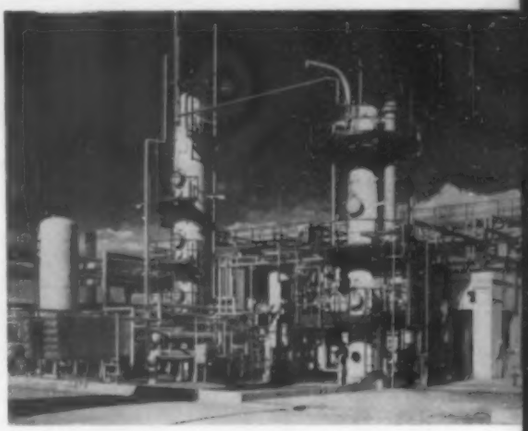
Table III shows design data for the three major operations.

TABLE III
DEWAXING UNIT
DESIGN DATA

	Charge B/SD	*D.W.O. Yield*	*Dewaxed Oil Pour Point °F*
Heavy Lube Dist.	2 030	81	+30
Intermediate Lube Dist.	2 563	80	+25
Heavy Lube Dist.	2 030	81	+30

The hydrofining process developed by Imperial (3) is a continuous operation using relatively simple equipment. The

A back view of the continuous blender panels showing pumping and control equipment. Photo courtesy of Imperial Oil Ltd.



Hydrofining unit with the reactor in the center and product stripper to the right. Photo courtesy of Imperial Oil Ltd.

View of solvent dewaxing plant showing filter building on the left and recovery towers on the right. Photo by Elwood Payne for The M. W. Kellogg Co.

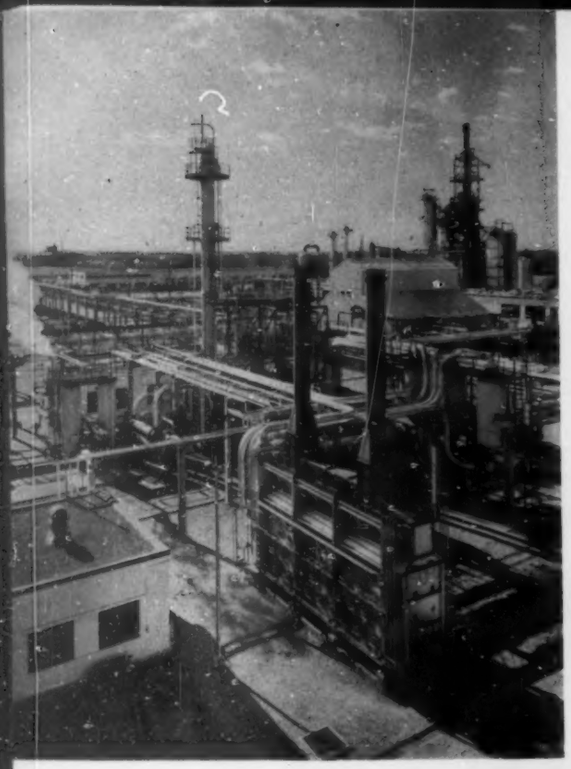


TABLE IV

HYDROFINING UNIT
FEED AND PRODUCT INSPECTIONS—MOTOR OILS

Grade	Light		Intermediate		Heavy	
	Feed	Product	Feed	Product	Feed	Product
Visc. 100°F. S.U.S.	162	158	577	566	1500	1418
Visc. Index	89	91	89	92	90	91
Color-Robinson	16	25+	9	18	3	9
Odor	Phenol	None	Phenol	Slight	Phenol	None
S.E. Number	50	25	200	40	1200	100
Conradson Carbon	0.01	0.001	0.02	0.01	0.25	0.12
Sligh Oxidation, 24 Hr. MGMS Sludge/10 gms.	30	10	15	5	2	1

The process conditions have been selected primarily to give products with better color than required by specifications and improvements in the other properties are incidental to the color improvement.

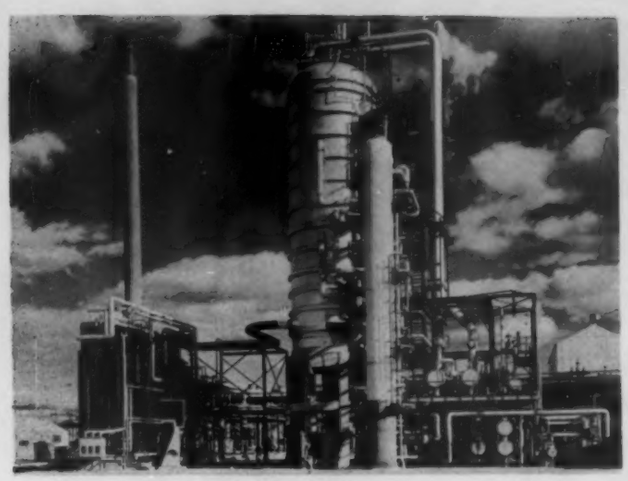
Catalytic reforming unit showing the Selas furnace in the foreground with the three reactors immediately to the rear. Feed preparation and stabilization facilities are in the center. The large structure in the right background is the refinery's Model IV catalytic cracking unit. Photo courtesy of Imperial Oil Ltd.

product yield is essentially 100 percent and there are no major waste disposal problems. The purpose of this finishing step is to ensure uniform product color, odor, stability and demulsibility. Since the process sequence of extraction prior to hydrofining allows considerable flexibility in control of product quality, design conditions have been chosen to balance throughout rates through each of the units.

The oil to be treated is passed at elevated temperature and pressure over a modified molybdenum on alumina catalyst in the presence of hydrogen. Operating conditions are varied to give desired product characteristics. The particular conditions which are used depend on the feed stock and the product quality requirements.

The unit is charged from a surge drum through exchangers and a Dowtherm heater to the reactor where the oil contacts preheated hydrogen as it flows downward over the catalyst bed. Hydrogen is disengaged in the bottom of the reactor, cooled and sent through a knockout drum to the refinery fuel system. The oil from the reactor along with material separated from the hydrogen in the knockout drum is stripped, vacuum dried, cooled, filtered and sent to base rundown tanks for final in-

The dewaxing unit. Photo by Elwood Payne for The M. W. Kellogg Co.



Vacuum distillation unit showing furnace, vacuum fractionator and lube distillate strippers. Photos courtesy of Imperial Oil Ltd.

Scraped surface exchangers shown from the non-drive end. The building in the immediate background shelters the drive end of the exchangers.

spection prior to pumping to base oil storage. Table IV shows feed and product inspection data on the hydrofining unit.

The catalytic reforming unit is conventional employing platium catalyst on a semi-regenerative basis and is designed to operate on a 400°F end point Leduc heavy naphtha to produce 90 percent yield of an 85 Research octane clear product. A steam reboiled stripper has been provided to supply a feed essentially free of oxygen and water. Feed is obtained either directly from the pipe stills or from tankage.

To provide process heat a Dowtherm system was constructed to supply heat to recovery reboilers in the phenol and dewaxing units and to heat both feed and hydrogen to the hydrofiner. Since a complete shutdown of all lube units for turnaround purposes is not contemplated, the system was designed with two furnaces to permit operation of one with the other off stream. One furnace will carry the load of either the phenol plant or the dewaxing plant and hydrofining units. The furnaces were designed for a heat input of 30 million Btu/hr. to the Dowtherm A. Outlet liquid Dowtherm is distributed to the users at 700°F at a rate of about 1000 gpm. The use of a liquid system proved feasible because of the high temperature rise in most of the process reboilers and as well because of the relatively low temperature level of other loads which permitted series flow of Dowtherm in some cases. It is believed as well that there will be less Dowtherm breakdown in a liquid system. In order to maintain a tight system flanged connections, valves and drips were eliminated as far as possible. Where flanges are required 300-pound ring type joints are used. Welding fittings and valves were used extensively. The system incorporates extensive protection facilities to safeguard equipment and to protect the Dowtherm. Furnace fires are automatically shut off on low surge drum level, low furnace flow, low gas pressure, flame failure and instrument air failure. A vent condenser, emergency cooler and complete drain system are provided to minimize Dowtherm losses on startup and shutdown and in the event of safety valves blowing. The flow through the system is shown on Figure 15.

All units previously described except for the vacuum distillation unit are grouped in one area and are operated from a central control room. The most modern and comprehensive instrumentation has been used. The control board is in the form of a graphic panel with miniature recorders incorporated in the flow lines. The board is divided into sections corresponding to the units in question.

Oil from the hydrofiner rundown tanks after inspection is pumped to base oil storage. For manufacture of finished oils blending equipment was required to mix base stocks and additives. A number of alternatives were open for selection of equipment for this service. After a careful study of the Edmonton requirements it appeared that the oils marketed could be divided into two general groups, the large volume rapid movers and the lower volume relatively slow moving products. It was decided that these two groups could be best produced by different equipment. Consequently equipment has been installed for continuous automatic blending of large volume oils and for batch blending of the lower volume products. The continuous blender supplied by Proportioneers, is capable of blending as many as six components simultaneously. In general these blends, produced on the continuous blender, consist of two base oils and up to four additives or additive blends. The Proportioneers blending equipment is equipped with safety and calibration devices to ensure that off specification blends cannot be made. The finished blends are sent to storage for testing prior to shipment.

The low volume oils are blended and tested in one of five batch blenders. For some of these oils storage is provided, for others, shipment and packaging is done directly from the blender.

Additives are stored indoors in large tanks in the heated tank room or in small elevated box tanks. Storage tanks, containing additives requiring heat to maintain fluidity, are provided with external tank heaters to minimize additive breakdown due to high skin temperatures. Finished oil storage tanks are heated in the same manner.

Finished oils may be shipped in quart cans, five or ten-gallon containers, drums or by tank truck or tank car. Packaging equipment is either automatic or semi-automatic in order to provide the most efficient handling of products. To ensure that there is no trace of contamination in the packaged oil, each packaging unit is equipped with a plate filter. A large warehouse is used for storage of packaged products. Handling is accomplished by fork lift trucks and is supplemented in the case of quart can cartons by automatic palletizing equipment.

To ensure that all products meet specifications and to provide laboratory service for the process unit operations, new and modern laboratory facilities were constructed. To aid in rapid and accurate analysis of the oils, an emission spectrograph is employed.

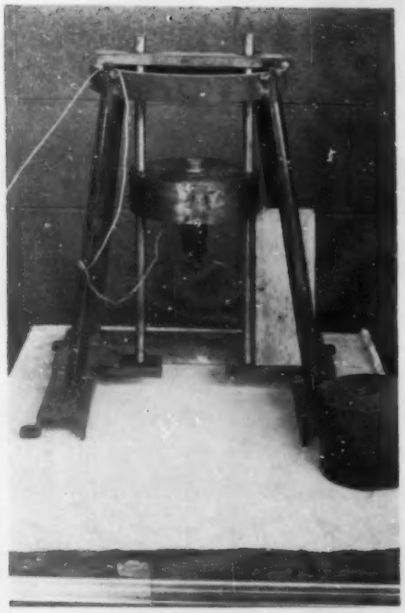
The construction and successful startup of these modern facilities makes available to western Canadian markets high quality lubricating oils of all types. The manufacture of these oils from western Canadian crudes culminates many years of endeavor on the part of Imperial's research and manufacturing departments.

December 8, 1955.

References—Stratford, Moor and Pokorny Oil and Gas Journal, March 30, 1933

Tiedje and MacLeod
Pet. Ref. Vol. 34, No. 2 Page 150 (1955)
J. of the Inst. of Pet. V 41 No. 373, Page 37 (1955)

W. A. Jones, Oil and Gas Journal, Nov. 1954



The drop tester on a block of Indiana limestone. A die-shaped chisel, 0.09 inch wide and ¾ inch long is attached to the weight.

Apparatus constructed for investigating the chip-clearing action of drilling fluids.

Jet bit with tubes added to test hypothesis that proper direction of fluid will reduce chip-clearance time.

Penetration rates can be increased 30 to 60 percent by adding hardness reducers to drilling muds. Rates of penetration may be cut in half by faulty chip clearance. Removal of debris from the bore hole is expedited by jet bits and control of effective mud viscosity.

Factors affecting drilling speed

CONFIRMATION of Russian research results in increasing drilling speed through the use of drilling fluid additives has been reported to the American Association of Oil Well Drilling Contractors by Battelle Memorial Institute, Columbus, Ohio. In a comprehensive report by Donald Gideon, Ralph Simon and Horace Grover, it is shown that drilling can be accelerated by 52 to 67 percent through the use of hardness reducers added to drilling fluids.

Examining other factors affecting drilling rates the researchers found that a large part of the effectiveness of a bit may be lost if chips are not cleared away quickly from the bottom of the hole. When chip clearance is slow the bit wastes energy grinding up the large rock fragments instead of making hole.

Chip clearance time can be lowered by bits with jets designed to clear away chips and by control of kinematic viscosity of mud to ensure maximum volume rates of flow. Jets which direct fluid flow toward the line of control of rollers with the bottom of the hole were reported to be most effective in removing debris.

Russian research into the use of hardness reducers was carried on over a 16-year period before being reported[1] to the Academy of Sciences in 1944. At that time it was claimed that drilling speed could be accelerated 30 to 60 percent by the use of fluid additives.

As reported in the AAODC study, "The Russian authors base their theory of hardness reducers on the state that the destruction of a solid body always consists of a gradual development of new interfaces with the surrounding medium and the magnitude of the free surface energy of the body being destroyed mainly determines the work of division of the solid into parts—the work of dispersion being a measure of the hardness." They go on to conclude that "the only significant effect of small additions to the medium surrounding the solid will be to reduce the hardness, and not to increase it.

"The action of the hardness reducers depends on the penetration of the wash solution into the developing microcracks of the rock under the cutting edge of the bit. Hydration of the ions or atoms of the crystalline lattice on the free surfaces of the microcracks is enhanced by the hardness reducers. With electrolytes, this effect may result from ionic exchange between the hydrophilic ions of the electrolyte and the less hydrophilic ions of the surface layer of the solid, thus binding a larger quantity of water to the solid surface. On the other hand, ions of the electrolyte may be absorbed, with the formation of a double electrical layer. Such an electrical double layer consists of the immobile adsorbed layer and a mobile diffuse layer the latter binding a large quantity of water to the surface. The hydration of a solid surface may also be increased by adsorption on its surface of organic surface-active colloids. The water found in a gelatinous film in this way is bound considerably less strongly than by adsorbed ions or molecules.

"It is characteristic of the electrolytic hardness reducers that their efficiency in aqueous solution shows a maximum at small concentrations. The optimum concentrations for electrolytes usually fall in the range from 0 to 0.5 percent. The organic hardness reducers, however, are adsorbed as neutral molecules, and the efficiency increases continuously toward a limiting value as the amount of substance adsorbed approaches a limit. Because of the relatively small volume of solution trapped in a microcrack compared with the surface, the concentration in the microcrack may be considerably less than that in the bulk solution. Therefore, it may be necessary to maintain the concentration in the bulk solution higher than the value determined to be optimum in laboratory measurements.

"The action of the hardness reducers in the developing microcracks appears then to be twofold: reduction of the free surface energy by adsorption and the binding to the surfaces of the microcracks of a film of water. The microcracks tend to heal themselves after the load on the tool is released, but the film of water in the crack requires time to flow out, the rate being lower the more tightly bound the film. Therefore, if the succeeding impact of the tool occurs soon enough that a given crack is still open, a chip will be produced more easily.

[1] Rchbinder, Schreiner, and Zhigach, "Hardness Reducers in Drilling," Academy of Sciences, USSR, Moscow, 1944. English translation by Council for Scientific and Industri-Research, Melbourne, Australia (1948).

reported to drilling contractors

"The Russian authors stated that greater benefits from hardness reducers were observed in percussion and rotary drilling, where the frequencies of impact are thousands per minute, than in cable-tool drilling, at frequencies of 50 to 100 per minute. In one experiment with aluminum chloride as the hardness reducer, the increase of drilling rate due to the hardness reducer was 10 percent at 70 blows per minute, and 60 to 70 percent at 1,600 to 2,000 blows per minute.

Russian reports were checked at Battelle. First, chisel experiments on Indiana limestone were used to determine whether the use of a hardness reducer has a significant effect on the amount of rock fractured out. These experiments were repeated several times for sodium hydroxide, calcium hydroxide, sodium carbonate, sodium silicate, and sodium phosphate. In three such experiments, a sodium hydroxide solution with concentration of 0.07 percent showed an increase of rock breakage of 52, 56 and 67 percent, compared with the experiments with distilled water. The other solutions showed no significant effects.

A second set of experiments was conducted under conditions more nearly simulating the action of a dull bit at the bottom of a drill hold. Two such experiments carried out with a 0.07 percent solution of sodium hydroxide showed that 22 percent more rock was broken where the solution was used than was broken where distilled water was used.

In a third set of experiments the concentration of sodium hydroxide was twice as great, 0.14 percent. Since the Russian report says that, for electrolytes, there is an optimum concentration for each rock type (for limestone, 0.05 to 0.7 percent sodium hydroxide), a test using twice the recommended concentration should show a lessening of the benefit derived from the hardness reducer. Two such tests for sodium hydroxide yielded benefits 20 to 60 percent as great as cited above from the optimum concentration.

The researchers point out that these results seem to contradict the observation that drilling rates with air as the flushing fluid are generally greater. However, better chip clearance with air under usual operating conditions may account for the greater drilling rates. Also, since the relationships between hydrostatic pressure and the strength of the rock are not fully understood, part of the explanation for the improved performance when air is used may be found in the fact that hydrostatic pressure on the drill-hole bottom is so small.

As mentioned previously the Battelle researches were asked by the AAODC to carry further the work which had been done previously for Drilling Researches, Inc., to study rock fracture with chisel edges. The previous work was limited to a study of the drilling effect of the energy and geometry of the bit and the patter of the flows on the rock. For AAODC this was to be extended in two directions; first, to the effects of stationary fluids on rock breakage and; second, to the effects of moving fluids on rock breakage.

In addition to the chemical additives proposed by the Russians, it was found at Battelle that water, weighted mud, bentonite mud and muds with starch or sodium carboxy-methyl-cellulose (CMC) all had an important effect on the drilling strength of rock. Dry Indiana limestone with a drilling strength of 13,000 psi dropped to 9,000 psi with fluid containing 35 percent starch on soaked rock or with 14 percent bentonite mud. Smaller losses of drilling strength were found with water, weighted mud and 4 percent CMC.

Most significant change of all was found when large chips were placed on a dry rock. In this case drilling strength increased to 28,000 psi more than double the dry rock.

With this clue the Battelle group proceeded to study factors which influence chip-clearance time. It was found that with a two- or three-roller bit rotating at 100 rpm a chip formed by one roller will be run over by the next roller in ⅛ to 3/10 second. Therefore, for optimum chip clearance, all chips should be off the bottom within about 1/64 second.

For the standard bit flow rates required for clearance of all chips within 1/64 second are about 50 gpm for water and some value over 120 gpm for the bentonite mud. Corresponding rates for the jet bit are 20 gpm and 50 gpm, respectively.

Turbulence as well as velocity of the fluid was found to be effective in clearing chips. There is an advantage of about 2 to 1 in flow rate for the jet bit over the standard bit, which agrees roughly with the better chip clearance with the jet bit. From the theory of fluid flow, it is expected that the greater speeds will produce greater turbulence under the rollers of the bit, thus moving the chips sooner.

A standard jet bit was modified by the researchers by the addition of tubes designed to direct fluid flow toward the position of chip formation under each roller. This modified bit gave chip clearance at 15 to 20 gpm compared with 55 to 60 gpm for the unmodified bit.

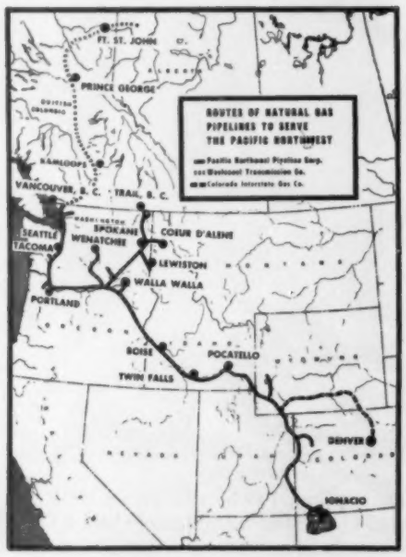
The researchers suggested that redesign of the jet bit to achieve a similar result would not be a simple matter. Mechanical strength of the bit is a prime consideration and an adequate fluid flow must be provided to raise chips to the surface. Suggestion was made that a by-pass might be designed to provide adequate fluid flow for lifting and still provide proper chip clearance. Studies were made into the effects of filtration rate and gel strength of drilling fluids. It was found that filtration is not significant, but that gel strength does adversely affect chip clearance time. The kinematic viscosity of fluids was reported to be more significant than absolute viscosity with low viscosity retarding chip clearance time. Increasing fluid density also affects chip clearance in the same way.

In air drilling the Battelle studies showed that hydraulic design is as important as in the case of liquid.

In the concluding remarks the researchers stated that the most profitable avenues for increasing drilling speeds seem to lie in a careful control of the chemical composition of drilling fluids and quick clearing of debris.

Problems in mud formulation to achieve desired results are somewhat complex and bit design for maximum speed in chip removal probably will cause a compromise in bit life and hydraulic effectiveness.

The feasibility of increasing penetration rates by using chemical hardness reducers will depend on costs. The increase in speed of 30 to 60 percent must be weighed against costs and complications of the mud problem.



FPC approves Canadian Gas Imports

THE U.S. Federal Power Commission, which took several years to decide one case involving natural gas supply from Canada, is expected to need many months in its new case, which involves Trans-Canada Pipe Lines Ltd. Hearings on the new matter, filed by Tennessee Gas Transmission Co., Houston, Texas, and a subsidiary, will be begun by an FPC examiner on Feb. 14.

The Tennessee series of applications represents a major step in natural gas development, including a new import of 200,000 mcf of natural gas daily. Therefore, extensive hearings are expected before an examiner, then preliminary reports, and finally oral arguments, time for appeals, and the ultimate decision.

The Tennessee applications are the target of attack, further, of several other American natural gas companies, chiefly because Tennessee proposes to serve markets other U.S. companies either serve or would like to serve.

Among the U.S. companies taking a dim view of the Tennessee proposals are Panhandle Eastern Pipe Line Co., Northern Natural Gas Co., Michigan-Wisconsin Pipe Line Co., Natural Gas Pipe Line Co. of America, Texas Illinois Natural Gas Pipe Line Co., Texas Gas Transmission Corp. All of these, along with U.S. coal interests, will have full time to appear in opposition.

The Tennessee applications, meanwhile, are a vital link in the Trans-Canada plans. Without the Tennessee project, the Trans-Canada project, as now set up, is not economically feasible. herefore, the fate of the Canadian venture, now substantially approved in Canada, hinges upon approval by the U.S. Commission. Conversely, the U.S. Commission will withhold approval, unless there is firm evidence that the Canadian venture, which is the basis of Tennessee's supply, will be completed.

Under the Tennessee series of applications: (1) A Tennessee subsidiary, Midwestern Gas Transmission Co., Houston, would construct a 1,112-mile, $98 million natural gas pipe line from Tennessee to Minnesota. It would serve, chiefly the Minnesota market; (2) Midwestern would obtain 200,000 mcf of gas daily from Trans-Canada near Emerson, Manitoba. It would obtain an equal amount from Tennessee; (3) Tennessee would spend $43 million to add to its system to deliver the gas to Midwestern; (4) Tennessee would deliver 86,775 mcf of gas daily to Trans-Canada at the international boundary near Niagara Falls, N. Y.

Midwestern would serve, at the start, communities and gas transmission and distributing companies in Minnesota, Wisconsin, western Michigan, and eastern North Dakota, the applications explain. Hearings on the Midwestern deal also will be undertaken by an FPC examiner on Feb. 14.

Northern Natural Gas is seeking to serve gas to Duluth, Superior and 25 other communities in the Midwest, many of which Midwest is relying upon for markets. The Northern proceeding is a separate one, and hearings were reported near the end as they resumed before the Commission on Jan. 23.

Midwest has asked to intervene in the Northern case in order to object. Further, Midwest is asking that the Northern and Midwest cases be consolidated into a single proceeding. While this is one conflict, others are appearing, and will continue, thus delaying a decision.

Trans-Canada, at the same time, faces a number of deadlines, as it seeks final clearances from the government agencies involved. One comes on May 1, the deadline set by the Canadian Government for Trans-Canada to complete its financing plan. This plan, further, can hardly be completed without a go ahead from the FPC to Midwest and Tennessee. Therefore, the chances are that Trans-Canada will seek, and probably obtain, an extension of the time limit.

The Trans-Canada-Tennessee-Midwestern deal, if it goes through, would represent the second major import of natural gas from Canada to the United States. On November 25 the U.S. FPC approved the long-standing plan of Westcoast Transmission Co. to export 300,000 mcf of gas into the U.S. Pacific Northwest. The decision came after the FPC at first refused to do this, and gave the nod to a U.S. firm, Pacific Northwest Pipe Line Corp., instead. Then, Pacific Northwest and Westcoast got together on a deal which has not been approved.

Westcoast, which is doing its work "right away" plans to complete the 650-mile, 30-inch line from Northern Alberta to the border by November 1957. The company has the bulk of the route located and flagged and 60 percent of it surveyed.

Delivery of the line pipe is expected in the first and second quarter of this year. Laying of pipe is expected to start in May or June, 1956, with four spreads, one at each end, and two in between. About 350 miles of pipe is expected to be in the ground by next November.

The FPC decision flashed the go ahead for expansion by the Pacific Northwest Pipe Line Corp. to handle the Canadian gas, and for the $142 million Westcoast Transmission Co. project. Frank M. McMahon, Westcoast president, said the decision of the FPC is "another example of cooperation" between the two countries.

It will mean, he said, "the immediate start of the most extensive drilling program in the history of the Northern Canadian fields.

"Pacific Petroleum Ltd. and its associates alone will be drilling a minimum of 70 additional wells. To process the gas, we will also need to construct gasoline plants and a 300 ton per day sulfur recovery plant. Other companies operating in the area, comprising practically every major Canadian and American oil company will likewise proceed with extensive exploration and development program."

Nearly one third of the large diameter pipe for the Westcoast line, he said, has been bought from Britain, a $12 million purchase. There will be jobs for 2,000 persons on construction. At capacity, the line will be capable of delivering 660 million cubic feet of gas a day to consumers in British Columbia and the United States.

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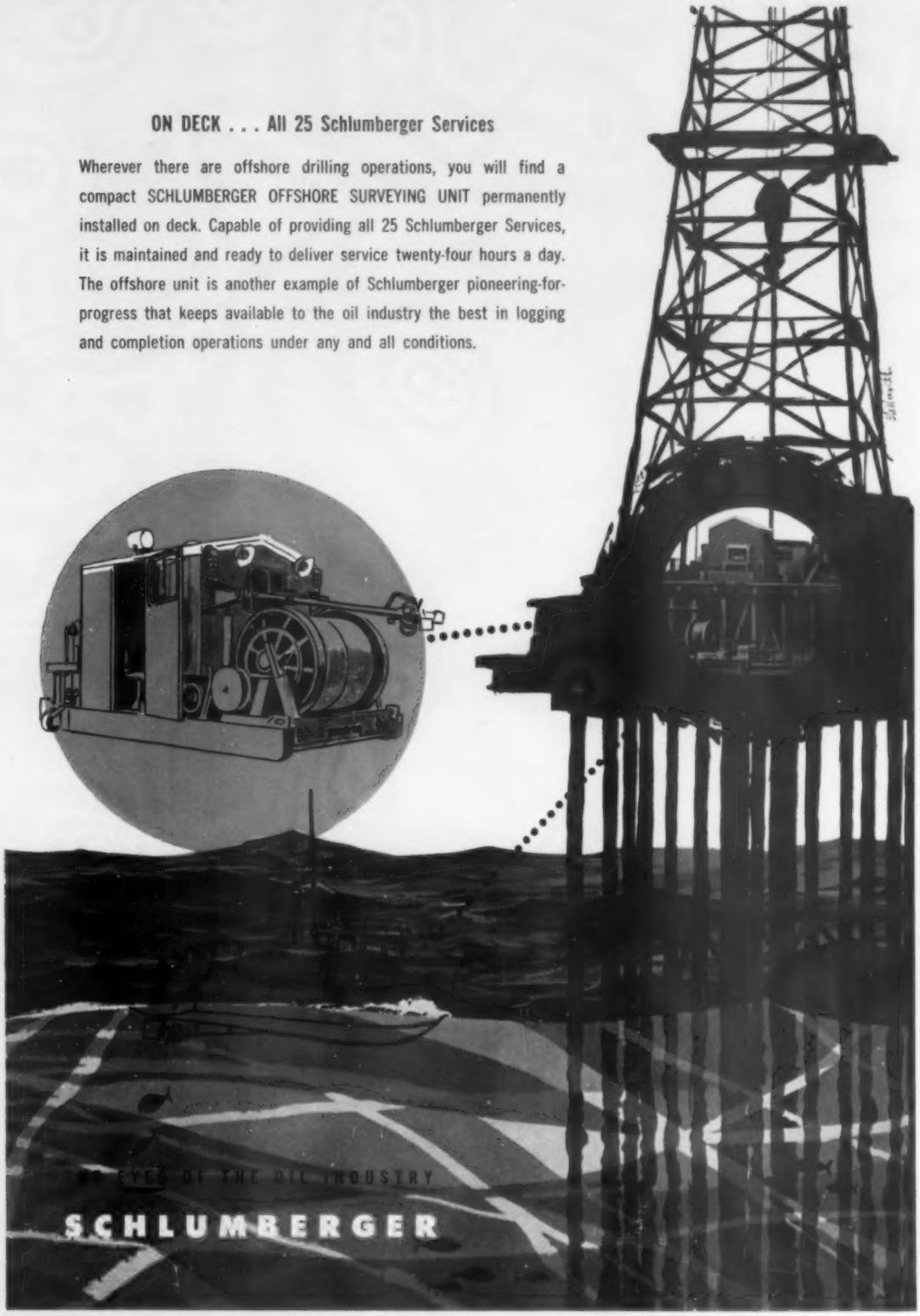

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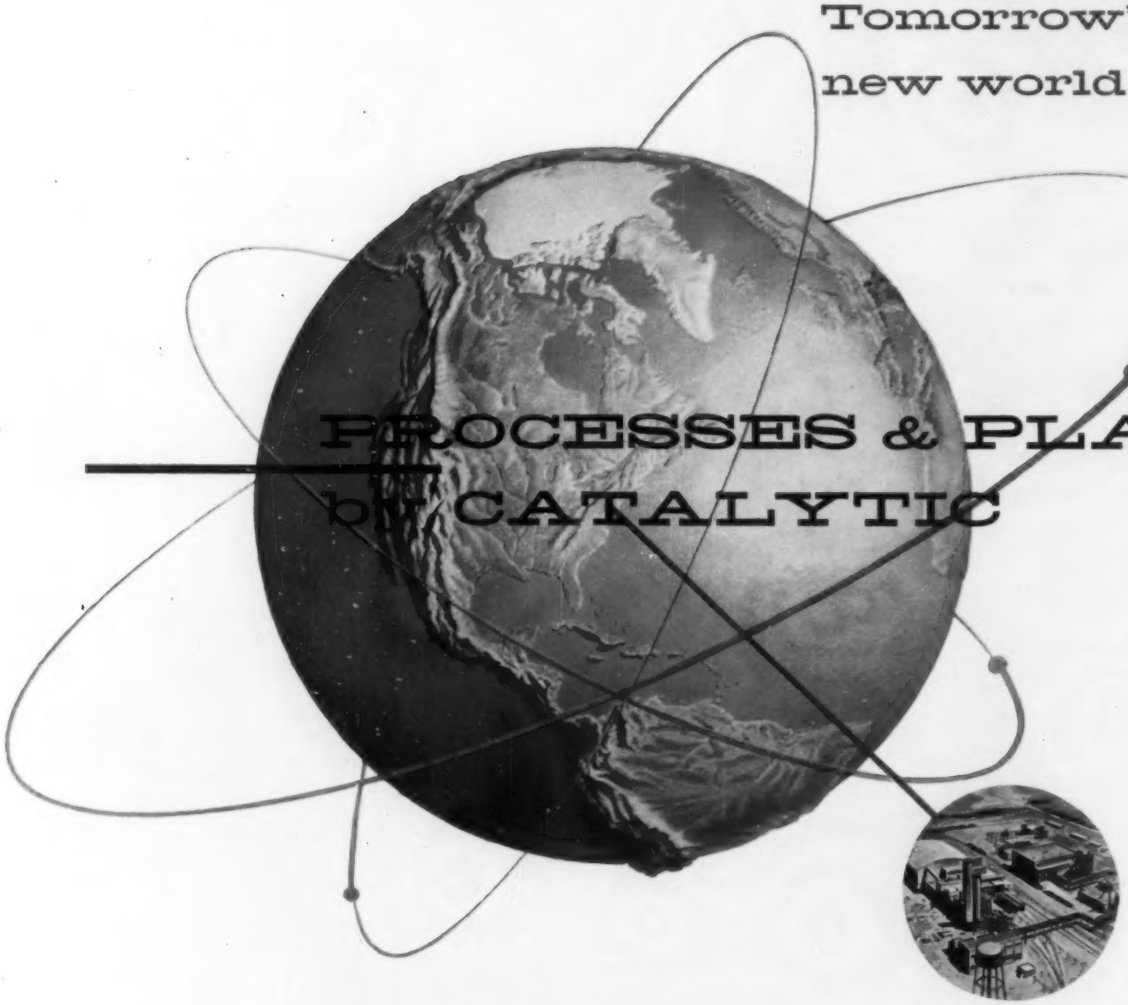

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Aden refinery oil harbor, one of the largest sources within the Middle East of refined products, run by British Petroleum. This aerial view shows tankers at the loading terminal.

Total Middle East oil exports in 1955 were up about 15 percent from 1954, based on the first nine months' figures. Crude shipments rose slightly to the west of Suez area, but rose sharply to east of Suez destinations. Product shipments rose sharply to west of Suez areas and rose slightly to east of Suez destinations with the coming on stream of the Abadan and Aden refineries.

Changes in Middle East oil exports

THE accompanying table illustrates the flow of Middle East crude and products to the various countries of the world. Detailed information of this kind must be compiled from many different sources, which are not yet available for 1955. Nevertheless, using known pipe line and refining capacities, together with the detailed statistics which are published by the Suez Canal authorities, a picture can be gained of movements to destinations east and west of Suez from this world's greatest petroleum exporting area during the first three quarters of 1955. The figures reflect stock changes, as well as bunkering requirements of tankers, but there are some small amounts representing shipments around the Cape of Good Hope which are not included.

During 1955, based on figures for the first nine months, total exports from the Middle East amounted to about 837,293,334 barrels of crude and refined products, or a daily average of about 3,067,000 b/d. This is approximately 14.6 percent over the corresponding period for 1954.

Shipments to west of Suez, which includes the great importing area of Western Europe, the U.S. and other west of Suez destinations, amounted during the first three quarters to 559,732,800 barrels of crude, up from 516,144,000 barrels during the same period in 1954. This total is obtained by adding to Suez Canal figures the total throughput of the Mediterranean pipe lines which amount to about 223,860,000 barrels for the nine months. Shipments of refined products to the west of Suez area, as represented by Canal shipments, rose by about 50 percent from their 1954 figure or from approximately 12,090,000 barrels to 24,457,500 barrels in 1955.

Due to the increased refining capacity of the Middle East, as represented by the coming on stream of the Aden and Abadan refineries, refined product shipments to the east of Suez area also increased substantially over the nine month period of 1955, as compared with the corresponding period of 1954. The increase was from about 121,476,400 barrels in 1954 to 152,375,100 barrels in 1955. This figure can be arrived at by subtracting from Middle East refining runs for the period the estimated consumption of the Middle East and refinery losses (estimated at 10 percent) as well as those quantities shipped to the west of Suez area.

Over the same nine months to total crude shipments to the east of Suez area nearly doubled, rising from about 68,314,000 barrels in 1954 to 113,100,434 barrels in 1955. This figure is arrived at by subtraction from total production in the Middle East during the nine months periods the amounts shipped by pipe line and via the Suez Canal to west of Suez destinations as well as runs to Middle East refineries.

An Aramco photo shows migrating Saudi Arab Bedu crossing Tapline, one of the great outlets for Arabian oil to the Mediterranean. The pipe line runs above ground with bridges built for caravans such as these.

A more detailed examination of destinations and sources of Middle East oil exports is available through the figures for Suez Canal shipments during the first nine months of 1954 and 1955. These represent about half of total exports from the area and as such are significant in themselves.

SUEZ CANAL OIL SHIPMENTS
Shipments North to South
(To East of Suez Destination)

Tanker Movements (Thousands of net registered Tons)	First 9 Months 1954	First 9 Months 1955	Rise or Decline Percentage
Loaded Tankers	3,156	947	—70
Empty Tankers	21,196	27,768	31
Total N-S Tanker Movements	24,352	28,715	17.9
Crude Oil & Products Shipments (Thousands of metric tons)			
Gasoline	1,282	456	—64.4
Kerosine	850	378	—55.5
Gas/Diesel Oil	513	202	—60.6
Residual Fuel Oil	2,687	359	—86.6
Other Oil Products*	38	38	00.0
	5,370	1,433	—73.3
Crude Oil	—	87	
Countries of Origin (Thousands of metric tons)			
Great Britain	1,655	54	—96.7
France	841	148	—82.4
Italy	1,078	279	—74.1
Netherlands	382	237	—38.0
Total Western Europe	3,956	718	—81.9
U.S.	514	151	—70.6
Caribbean	546	76	—86.1
Total Western Hemisphere	1,060	227	—78.6
U.S.S.R. & Romania	263	554	110.6
Other areas	91	21	—76.9
	5,370	1,520	—71.7
Areas of Destination (Thousands of metric tons)			
India, Pakistan, Burma, Ceylon	1,556	165	—89.5
British Malaya	542	194	—64.2
Australia, New Zealand	481	111	—76.9
Total Far East	2,579	469	—81.8
Red Sea Ports	797	445*	—44.2
Aden	1,453	119	—91.8
Persian Gulf	49	33	—32.7
Total Middle East	2,299	597	—74.0
East Africa	312	81	—74.0
USSR (Siberia, China)	159	359	125.8
Other Areas	22	14	—36.4
	5,371	1,520	71.7

*Excluding lubricating oil shipments which amounted to 192,000 tons for the first nine months of 1954 and 270,000 tons for the same period in 1955.

*Of which 315,700 tons went to Egypt (Suez)

SUEZ CANAL OIL SHIPMENTS
Shipments South to North
(To West of Suez Destination)

Tanker Movements (Thousands of net registered Tons)	First 9 Months 1954	First 9 Months 1955	Rise or Decline Percentage
Loaded Tankers	23,101	27,418	18.7
Empty Tankers	751	253	—66.3
Total S-N Tanker Movements	23,852	27,671	16.0
Crude Oil & Products Shipments (Thousands of metric tons)			
Crude Oil	40,595	46,649	14.9
Gasoline	283	373	32.3
Kerosine	168	331	97.0
Gas/Diesel Oil	400	828	107.0
Residual Fuel Oil	554	1,516	173.6
Other Oil Products	207	213	2.9
Total Oil Products	1,612	3,261	102.3
Total Crude Oil and Products	42,207	49,910	18.3
Countries of Origin (Thousands of metric tons)			
Kuwait*	30,680	32,369	5.5
Saudi Arabia	4,935	4,997	1.3
Iran	105	3,598	3326.7
Iraq (Fao)*	1,991	2,946	48.0
Qatar	3,075	2,704	—12.1
Bahrain	696	1,252	79.9
Aden	—	434	—
Total Persian Gulf	41,482	48,300	16.4
Egypt*	43	86	100.0
Indonesia, Malaya, Borneo	593	1,477	149.1
New Guinea	89	47	—47.2
Total Far East	682	1,600	136.1
Total Persian Gulf & Far East	42,207	49,910	18.3
Countries of Destination (Thousands of metric tons)			
Great Britain	15,484	15,744	1.7
France	8,168	9,074	11.1
Netherlands	4,192	5,420	29.3
Italy	3,985	5,389	35.2
Belgium	1,337	1,485	11.1
Spain (incl. Canaries)	1,177	1,407	19.5
Sweden	1,014	1,285	26.7
Germany	796	978	22.9
Total, Major European Oil Importing Countries	36,153	40,782	12.8
U.S.	4,749	6,521	37.3
All Other Countries	1,305	2,607	99.8
	42,207	49,910	18.3

*Including Kuwait Neutral Zone
*Mainly domestic transfer shipments from Red Sea to Mediterranean ports.

Source: Suez Canal Reports and World Business by Petroleum Industry Research Foundation.

Shipments West of Suez. Shipments of crude and products to countries west of Suez during the first nine months of 1955, based on Suez Canal reports, totaled 49,910,000 metric tons or 18.3 percent over the corresponding period in 1954. The larger share was crude with 46,649,000 metric tons, up 14.9 percent over 1954. Product shipments increased sharply with the coming on stream of the Abadan and Aden refineries and more than doubled with an increase of 102.3 percent to 3,261,000 metric tons. The largest share was residual fuel oil, followed by gas and Diesel oil.

The bulk of these shipments, 40,782,000 metric tons, went to Europe, with a 12.8 percent rise over shipments to the same area during the first nine months of 1954. The United States received 6,521,000 metric tons shipped through the Canal, a rise of 37.3 percent over 1954. Of the European shipments Italy showed the largest increase over 1954, with a rise of 35.2 percent to 6,389,000 metric tons, but Britain remained the largest single destination with 15,744,000 metric tons received, an increase of about 1.7 per cent over 1954. France, with 9,074,000 metric tons was 2nd largest destination of crude shipments and increased her receipts of crude by 11.1 percent over 1954.

The major source of Canal shipments was Kuwait, with 32,369,000 metric tons, an increase of 5.5 percent over 1954. Saudi Arabia shipped a total of 4,997,000 metric tons via the Canal which was 1.3 percent over 1954. Iran showed the expected increase with the resumption of operations after the Consortium took over, an increase of 3326.7 percent over 1954 to 3,598,000 metric tons. Increases of 48 and 79.9 percent were shown by Iraq and Bahrein to 2,946,000 and 1,252,000 metric tons respectively. The only country that declined on shipments was Qater, which was down by 12.1 percent from 1954 levels with 2,704,000 metric tons.

There is a considerable movement the other way through the Canal to the East of Suez area. These are mainly of products and declined substantially from 1954. Total shipments of products were 1,433,000 metric tons, mainly of gasoline and residual fuel oil, plus 87,000 metric tons of crude. The total of products declined by 73.3 percent from 1954 levels, probably due to the increased refining activity in the Middle East ern area. There were no crude movements in this north-south canal traffic during 1954.

PARTIAL SUMMARY OF MIDDLE EAST OIL EXPORTS BY SOURCE AND DESTINATION

(IN BARRELS)

	SAUDI ARABIA (1954)	IRAQ (1954)	IRAN (Jan-Jun '55)	QATAR (1954)	BAHREIN (1954)	KUWAIT (1954)
Crude Exports	268,093,000	220,491,000	41,580,000	35,816,000	(5)	336,315,000
Refinery Output	76,900,000	6,190,000	17,460,000	—	78,100,000	10,251,000
Domestic Demand	14,500,000	7,941,000	9,000,000c	634,000	8,900,000	8,415,000
Refinery Exports	62,400,000	—	NA	—	69,200,000	744,000
EXPORTS (TOTAL)	330,400,000	—	—	35,816,000	69,200,000	338,060,000
Crude Production	347,845,000	228,432,000	50,580,000	36,450,000	11,000,000	347,319,000
DESTINATION						
Argentina	—	—	—	—	—	11,441,000
Algeria	132,000p	—	—	—	—	—
Aden	—	—	—	—	—	(11,461,000c (84,000p
Australia (1)	(3,053,200c (2,961,822p	—	(5,939,635c (485,931p	—	8,894,914	3,539,000c
Bahrein	67,500,000c	—	—	—	—	—
Belgium	1,585,087	6,826,161c	1,348,720	—	223,650	4,299,000c
Burma	92,026p	—	—	—	107,991	—
Canada	6,685,570c	—	112,343c	—	—	—
Ceylon	1,033,000p	—	335,153	—	1,447,000	—
Chile	386,000c	—	—	—	—	—
Egypt	3,749,000p	—	807,744	—	—	—
France	23,587,620c	76,166,600c	2,203,383	10,905,180c	—	42,645,000c
Germany	19,278,630c	11,798,370c	532,099c	480,446c	—	592,000c
Holland	16,493,847c	3,295,835c	2,497,440	2,508,115c	485,932	36,178,000c
Israel (2)	—	—	1,000,000	—	—	—
Italy	37,228,566c	49,945,468c	(1,630,317c (416,095p	1,839,033c	—	(23,213,000c (349,000c
Formosa	—	—	—	—	—	1,433,000c
Japan	(31,398,930c (7,225,408p	—	(137,045c (1,982,822p	—	—	2,308,000c
Malta-Cyprus	—	—	—	—	559,125	—
Malaya	1,322,219p	—	—	—	3,649,066	—
Portugal	245,000c 852,000p	5,000,000c	46,890p	—	—	—
Philippines	2,605,000p	—	—	—	1,914,000	—
Pakistan	1,263,000p	—	—	—	2,788,000	—
South Africa	(5,000,000ce (1,000,000pe	—	—	—	2,000,000e	—
Spain	11,088,794c	102,918c	—	344,665c	—	—
Canary Is. (1953)	4,616,061c	—	—	—	—	1,953,000c
Sweden	(3,504,000p (246,000c	459,335c	828,590	1,737,805c	610,000	1,599,000c
Singapore	—	—	—	—	—	817,000p
Syria-Lebanon (3)	—	6,330,084c	—	—	—	—
Turkey	2,574,510	—	—	—	964,007	—
United Kingdom	1,158,000	37,419,934c	3,135,576	10,604,983c	13,196,000	(486,000p (145,139,000c
United States	30,310,034c	1,349,283c	—	2,751,080c	108,125	42,680,000c
Uruguay	1,045,000c	—	—	—	—	8,000
Yugoslavia	—	2,943,194c	—	—	—	100,000c
All others	41,179,676	18,853,818	18,140,217 (4)	4,644,693c	32,252,190	7,736,000
TOTALS	330,400,000	220,491,000	41,580,000	35,816,000c	69,200,000	338,060,000

* eEstimated. NANot Available. cCrude. pProducts. Where no designation appears, nature of shipment is unknown. Conversions from barrels to tons, when necessary, have been done at the following rates: Iraq, 7.463; Iran, 7.331; Saudi Arabia, 7.455; Qatar, 7.626; Bahrein, 7.335; Kuwait, 7.259. (1) Australian figures refer to the June 1954 through June 1955 period. In the case of Iran no shipments were received until after December 1954. (2) Shipments via the Cape of Good Hope. (3) Shipment for domestic consumption. (4) Includes shipments to refinery at Aden. (5) To crude production must be added 67,500,000 barrels of crude received from Arabia for refining. Exports are not specified but are mostly products.

SOURCE: Compiled from many different publications and sources abroad, with the exception of Kuwait figures, which are from the U.S. Bureau of Mines.

Oil and chemical companies have purchased large blocks of land in the 1,000-square-mile shale oil region in Colorado at rising prices as interest in these reserves grows. Union Oil Co. is undertaking a $5 million shale oil recovery research program as the government halts its experiments.

Where Oil Shale Stands Today

By Russell J. Cameron

Progress toward an oil shale industry in the United States made a significant step during the past year with the announcement by the Union Oil Company of California of a $5 million development program leading to eventual commercial utilization of Colorado oil shale. At the same time, the Department of the Interior ended its research and development activities on oil shale processing at Rifle, Colorado. Since 1944 the Government's work at Rifle has represented the principal effort toward the development of economical processes for American oil shales. With the Government feeling that this phase of it's job is complete and private industry investing substantial funds in the final experimental step, the long anticipated oil shale industry may be in sight.

Historical Background—Oil shale in the United States had its beginning at the time of the Revolutionary War when the oil shales and cannel coals of New York, Pennsylvania and the other colonial states provided what little need there was for oil. For the next few decades "coal oil," and to a certain extent, shale oil or it's close relatives, helped the whales light the lamps of the country. Colonel Drake's discovery of oil in Pennsylvania spelled the end of coal and shale distillation for the production of oil, and to this day there has been no need to revive the industry.

When the automobile began to take it's place as the principal factor in the petroleum industry, interest again was aroused in oil shale. About the time of World War I, the vast oil shale deposits in Colorado, Utah and Wyoming, and to a certain extent in other areas, attracted a great deal of attention. Most of the oil shale areas were defined and much of the land was claimed under mining law. The United States Navy reserved a large area for a Naval Oil Shale Reserve. Most of the 3,000 patents for oil shale processes were taken out during this period.

Numerous oil shale companies were formed and some plants were built, but unfortunately for the investor the ventures were unsound, most from a technical standpoint and all financially. The few that were legitimate enterprises were driven into bankruptcy by the petroleum discoveries of the late nineteen twenties, and soon interest in oil shale was dormant once more.

It was not until World War II that oil shale again was given serious consideration. The possibility that domestic petroleum resources might prove inadequate caused the government, through it's synthetic liquid fuels program, to investigate coal, oil shale and other materials as supplements to petroleum. The U. S. Bureau of Mines has been at the forefront of the activity which began at this time, and the government has been the principal contributor in terms of

Russell J. Cameron of Cameron and Jones, consulting engineers, Denver, has had extensive experience in shale oil development work. During seven years with the U.S. Bureau of Mines at Rifle, Colorado, he worked on all phases of the program including mining, retorting and refining. He organized, trained and directed a process evaluation group and later was responsible for process development as director of a staff of 30 engineers and chemists and 50 non-technical operators. Experimental plants in this work included a semi-commercial thermal cracker and associated treating plant, a shale crushing plant, three retorting pilot plants and other equipment.

Mr. Cameron was engaged in synthetic rubber research prior to joining the Bureau of Mines shale oil project in 1948. He organized his present consulting firm last July in association with John B. Jones, Jr. and Arthur Matzick, both of whom were associated with him at Rifle.

Russell J. Cameron

Oil shale experiment station of the U.S. Bureau of Mines near Rifle, Colorado, for eleven years has been the center of oil shale development work in the United States. Process facilities have been placed in stand-by. Except as otherwise noted, all photographs with this article are reproduced through the courtesy of the U.S. Bureau of Mines.

Technically, oil shale contains no oil, but a fragment of it can be ignited with a match. Oil shale contains an organic material known as "kerogen" which is converted into oil when heat is applied.

Dumping shale to stock pile at Rifle experimental mine. In commercial practice retorts located at mine elevation will dispose of spent shale to adjacent canyons, piping oil to central refinery.

money and effect toward developing a technology by which oil shale could be utilized in time of need.

Starting in 1944 and continuing for eleven years, the authorization for the government's synthetic fuels work totaled $87.6 million, of which oil shale received about $20 million. Basic research and bench-scale development on oil shale were conducted at Laramie, Wyoming, where work is continuing. Mining research and pilot plant development on oil shale retorting and shale oil refining were done at Rifle, Colorado, at the site of large shale deposits. Except for mining research, this work has been discontinued.

During this same 11-year period, various companies in the petroleum industry also investigated oil shale technology. While significant retorting developments outside the government were limited to a few companies, most of the country's leading petroleum companies have investigated the refining and utilization of shale oil. Chemical companies also have been active.

Status of Oil Shale Technology—The key to practical utilization of oil shale is an efficient economical underground *mining* method. One and a half tons of shale must be processed to obtain a barrel of oil, and the richest shale lies under a heavy overburden. A highly mechanized underground mining operation has been developed and demonstrated on a full scale by the Bureau of Mines at Rifle. While improvements to the method are possible, from the standpoints of safety, efficiency of shale recovery, and cost, an oil shale mine utilizing the basic plan developed at Rifle would seem to be an adequate starting point for commercial shale oil production.

Of the dozens of oil shale *retorting* methods considered during this last eleven years of intensive development work, and the several actually tested on a pilot plant scale, two processes have emerged that offer possibilities of meeting today's requirements. The gas combustion process developed at Rifle has been carried through a series of pilot plant steps, finally being operated on a scale exceeding 150 tons per day. This process has a high unit capacity, recovers most of the assay value of the shale, requires no process water, and has low capital and operating costs. Commercial units as large as 2,000 tons a day seem possible. Ten such retorts would comprise the minimum size commercial plant.

The retort developed by the Union Oil Company of California has been operated on a scale of about 30 tons a day at Union's Wilmington, California refinery. The major effort of the company in it's present development program is to test the retort on a larger scale at a site being prepared on it's properties near Grand Valley, Colorado.

Neither the Union nor the Gas Combustion retort has a counterpart in industry, and adequate tests on a large scale are required before building commercial size plants. It is unfortunate that complete design and performance data were not obtained on the large Gas Combustion retort before development work on the process was recessed.

The third, and a very important phase in the utilization of oil shale, is *refining* of the crude shale oil. Colorado shale oil is in the heavy oil class, about 20 API gravity. It contains appreciable quantities of sulfur, nitrogen and oxygen compounds and, being a product of cracking, it has many characteristics of a heavy cycle stock. Despite this, shale oil can be refined satisfactorily by conventional methods. Furthermore, the newer refining methods using hydrogen as a reagent, which are being developed for heavy crude oils, are particularly effective for shale oil.

With the trend toward more complex and expensive refining techniques to achieve the product quality demanded by today's market, deficiences in the starting material are less important. Some form of hydrogenation combined with conventional catalytic cracking and reforming processes appear entirely feasible for shale oil refining. A full range of products meeting or exceeding current specifications is possible. Without question shale products will compete quality-wise with those from petroleum.

Economics of Shale Oil—In 1949 the Bureau of Mines demonstrated in a 30-day test that oil shale could be mined for a direct cost of less than 50 cents per ton. Extrapolation of pilot plant results on both the Union and the Gas Combustion retorts indicated processing costs of this same order of magnitude. In 1951 a National Petroleum Council committee made a comprehensive study of the economics of synthetic fuels production, including oil from shale. It's findings, shown in the tabulation below, indicated that shale fuels can be used to supplement California oil reserves with very little increase in product prices over current levels.

OIL SHALE COST ESTIMATE
National Petroleum Council
1951

	Industry Development (250,000 b/d)	*Single Plant* (50,000 b/d)
Investment—Daily Barrel	$6,000	$6,650
Gasoline cost, excluding profit, per gal.	7.7¢	8.5¢
Refinery price to net 6% return, per gal.	14.7¢	16.2¢

When it is considered that these costs include all facilities from mining to the delivery of manufactured products to the Southern California marketing area, shale oil may be very near today's cost of petroleum from well to tank wagon.

Development work since the NPC study has not resulted in significant changes in oil shale technology but rather has served to confirm with more reliable data the conservatism of the technical basis for the study.

Current Development Activities—The Union Oil Company of California announced in February 1955 the start of a program of investigations to resolve the economic status of shale oil fuels. According to Reese Taylor, president, Union owns in fee about 50,000 acres of the richest and most accessible oil shale land. Reserves are estimated at five billion barrels. The present research and development program, to cost $5 million, is to do three things; first, test the full scale operating feasibility of the Union retorting process; second, confirm present or suggest alternative manufacturing procedures and refining designs; third, provide a basis for estimating capital expenditures and operating costs.

Union's experimental retort is being constructed under the direction of Stearns-Roger Manufacturing Company of Denver at a site near the town of Grand Valley, Colorado, a few miles from the government's Rifle Station. According to the present construction schedule the retort should be in operation by the fall of 1956. Refining investigations are being conducted at the company's research facilities in California. The program does not include experimental work on mining.

The Bureau of Mines has discontinued process development work at Rifle, and Boyd Guthrie, superintendent of the experiment station since its beginning in 1945, has been transferred to Laramie, Wyoming, along with a small technical group to prepare final engineering reports. The staff at Rifle, which numbered some 230 during development activities, has largely been disbanded.

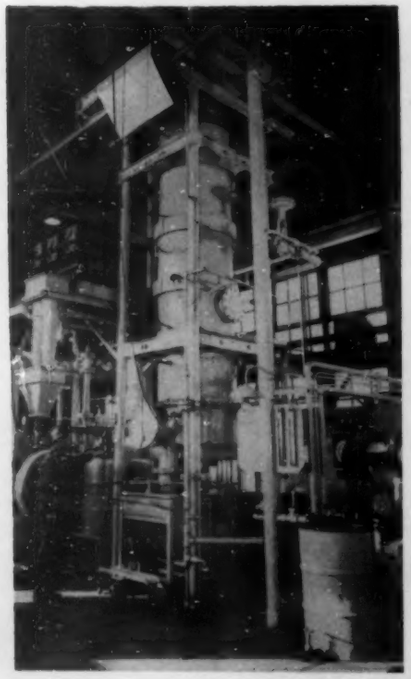
The Rifle operations were appropriated $1 million for the fiscal year ending July 1, 1956, the money to be used for mining investigations, except for that amount required to place process facilities in standby. The continuing investigations are to study the conditions that caused a roof fall in February 1955 and to determine what modifications to the mining plan might be necessary to insure a safe working condition. At present two drifts are being driven to virgin areas in order that roof conditions may be studied and variations to the mining method tested if necessary.

The Navy Department, which has a direct interest in oil shale through it's proprietorship of some 60 square miles of oil shale reserves, may request authority from Congress to take over the activities at Rifle from the Interior Department. It's objective would be to improve the mining method and to operate a full-scale retort.

Past work at the Mines Bureau's Laramie laboratories has been devoted to bench-scale process research and to fundamental studies of oil shale and shale oils. Considerable effort has been given to the study of oil shale pyrolysis at higher than normal temperatures. High temperature retorting gives a product chemically different from the usual shale oil and also yields product gases rich in unsaturated hydrocarbons. This method of oil shale processing may have possibilities for the production of organic chemicals.

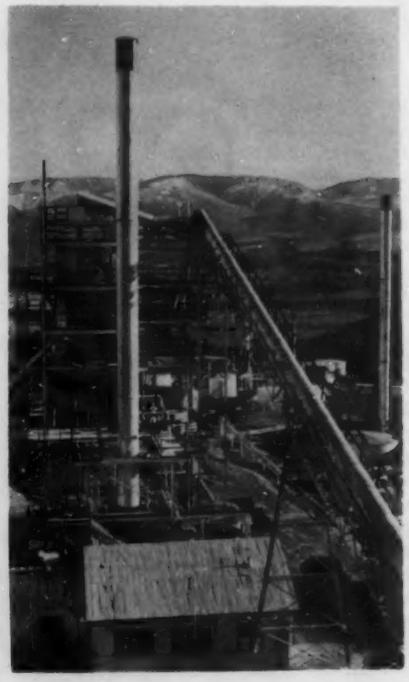
The continuing work of the Laramie station will adhere closely to the lines of fundamental research work. Studies of the composition of oil shale and the constitution of kerogen, refining of shale oil by hydrogenation, characterization of high-boiling components, and oil recovery by means other than pyrolysis will be continued. The assaying of core samples on a cost sharing basis to add to the fund of

Pilot plant at Rifle, Colorado, where gas combustion oil shale retort was developed. Counter-current heat exchange of spent shale to recycle gas and products of retorting to raw shale gives a very high thermal efficiency.



Rifle experimental oil shale mine. The rich shale measure is excavated on a room and pillar pattern, using the largest possible underground mining equipment. Demonstrated mining costs of 50 cents per ton make oil shale a feasible supplement to petroleum.

150 ton per day gas combustion retort at Rifle. Built to provide design and performance data for commercial scale retort. Plant was operated over a period of 18 months and exceeded design capacity by almost 50 percent.



knowledge on shale reserves continues.

Considerable attention has been attracted by field experiments of the Sinclair Oil Corporation on the retorting of oil shale in place. "In Situ" retorting has been practiced in Sweden, and it's attractiveness lies in the elimination of the mining and shale handling steps. The Sinclair method differs from the Swedish in that underground combustion of the shale is used to generate the heat required for distillation, whereas in Sweden electrical resistance heating was used. The Swedish method is economical only when excess hydro-electric power is available at very low cost.

There has been no public disclosure of the results of Sinclair's work, which was conducted on their property near DeBeque, Colorado. However, the project was inactive during the summer of 1955. Problems to be overcome to successfully retort Colorado shale in place are considerably different from those of the Swedish shale.

Several other companies are reported to be conducting laboratory work or paper studies. No projects the size or scope of those discussed previously are known to be under active consideration.

Stock promotions, which usually follow in the wake of any new development, are likely to increase in number as evidence of serious intent by private industry increases. Several have appeared the past year.

Oil Shale Land Activity—The richest and most accessible oil shale deposits lie within a 1,000-square-mile area in northwestern Colorado. Naval petroleum reserves comprise about 60 square miles and, except for some mostly inaccessible land which is still public domain, the remainder is in private hands. Some companies, such as the Union, acquired their original land holding during the earlier oil shale activity. The late D. D. Potter of Denver and others performed a valuable service by proving up and consolidating hundreds of scattered claims into sizable blocks, many of which now have been acquired by companies with sufficient resources to develop them. Major land holders, in addition to the Union, include Standard Oil Company of California, Sinclair Oil Corporation, Pacific Western Oil Corporation, The Texas Company, Continental Oil Company, Gulf Oil Corporation, Shell Oil Company, General Petroleum Corporation, and the Dow Chemical Company. Sizable blocks of land still are held by individuals or groups not directly connected with the petroleum industry. Most, if not all oil shale lands are held in fee, ownership having been obtained by bringing to patent the original placer claims.

Land values have risen sharply the past ten years from as little as $10 per acre for fairly good land to an asking price of $450 per acre for a very good small parcel. Some purchase agreements also include a royalty feature. A recent major transaction was made at a price of $125 per acre. Current top prices still are less than $0.005 per barrel of oil in place.

Oil shale retort developed by the Union Oil Co. of California. Unique piston device pushes shale upward while suction blower creates down draft of air from combustion. Coke remaining in the shale after oil is distilled provides fuel for the process. Union Oil Co. of Calif. photo.

Land values have risen sharply the past ten years from as little as $10 per acre to an asking price of $450 per acre for good land. Some purchase agreements also include a royalty feature. Current top prices still are less than one cent per barrel of recoverable oil in place.

Foreign Oil Shale—Although this paper is devoted to domestic oil shale developments, brief mention should be made of foreign oil shale industries.

Elsewhere in the world shale oil has been used continuously for many years. Although for the most part these industries have been protected in some manner, oil shale has been resurgent during and since World War II in several countries.

In the western hemisphere, Brazil has launched an ambitious program to save foreign exchange by producing oil from its substantial oil shale resources. The Brazilian national oil company, Petrobras, has underway a development program leading to construction of a 10,000-barrel-a-day plant. Technologists from the United States are assisting in all phases of the work.

Scotland, which has the oldest continuously operating industry, is now testing the Gas Combustion retort developed by the Bureau of Mines. The Pumpherston retort has been the mainstay of the Scottish shale industry since 1895.

Sweden began to produce shale oil in about 1941 and now has a well established industry. Recently the plants were modernized and production increased.

Spain now has a recently completed oil shale plant in operation, reportedly processing several thousand tons of shale daily. The refinery utilize hydrogenation to manufacture high quality lubricants as well as other products.

Oil shale is also processed in Germany and France, and an effort is being made to start some production in Yugoslavia. In Estonia, where the largest and richest oil shale deposits in Europe are located, the Soviet Union is reported to have expanded shale oil production substantially.

The largest pre-war production of shale oil was in Manchuria—some 10,000 barrels a day. The area was visited by U. S. technologists in 1946, but little current information is available.

In Australia, where production was expanded during World War II, the plants have been abandoned. Unfavorable mining costs and obsolete process equipment contributed to shales failure to survive.

In the Union of South Africa, although small scale operations are continuing, inadequate oil shale resources have discouraged modernization or expansion. The world's first large-scale, synthetic oil-from-coal plant is now in operation about 50 miles south of Johannesburg.

Conclusion—The trend of the past few years clearly indicates increasing interest in oil shale despite discoveries of oil in new areas and expansion of production and reserves in most of the world's established oil provinces. The reasons are many fold—rising costs of finding oil, defense considerations, advances in technology—but most important is the relentless increase in the demand for energy in all forms, which no one dares predict will slacken. With the demand for petroleum expected to double within 20 years, liquid fuels from oil shale should find a ready market.

Lord Strathalmond

Neville A. Gass

Hon. Maurice Bridgeman

BASIL JACKSON to become chairman of British Petroleum Co.

Basil R. Jackson

THE board of directors of The British Petroleum Company announced January 12 in London that Lord Strathalmond, chairman, plans to retire from his post on March 31. On that date he will have completed 33 years of service as a director of the company, for 28 years of which he will have been chairman or deputy chairman.

It is the board's intention, the announcement said, to appoint Basil R. Jackson, the present deputy chairman, to be chairman and Neville A. Gass to be deputy chairman as of April 1, 1956. The Hon. Maurice Bridgeman will be appointed as director to fill the vacancy on the board resulting from Lord Strathalmond's retirement.

William Fraser, 1st Baron Strathalmond, has been chairman since 1941 and a managing director since 1923 of The British Petroleum Company Ltd. and predecessor Anglo Persian and Anglo Iranian Oil Companies. He is the son of the late William Fraser, founder and managing director of the Pumpherston Oil Co., the leading Scottish shale-oil company.

In 1909 he joined his father's company and visited Canada and the United States on its business. In 1913, at the age of 25, he became a director of the Pumpherston Oil Co., succeeding his father as managing director on the latter's death in 1915.

In 1918 he again visited the United States as chairman of the Inter-Allied Petroleum Conference Specifications Commission, which dealt with specifications and supplies of petroleum products for the Allies in the First World War. He was created a Commander of the Order of the British Empire in 1918 for war services.

In 1919 he formed Scottish Oils Ltd., which combined the producing and marketing interests of all the Scottish shale-oil companies under the aegis of the Anglo-Persian Oil Co. as The British Petroleum Company Ltd. was then named. He became a managing director in 1923, deputy chairman in 1928 and succeeded the late Lord Cadman as chairman in June, 1941.

Among the outstanding achievements of his business career were his participation from 1929 onwards in the development of the Iraq Petroleum Co. group; the formation in 1931 of Shell-Mex and B. P. Ltd. as the joint marketing company for the British Petroleum and Shell groups in Great Britain and Ireland; the negotiation in Tehran of the 1933 Agreement between Persia and the then Anglo-Persian Oil Co.; and the formation in 1934 of the Kuwait Oil Co.

He was knighted in July 1939 for public services and during the next six years was closely concerned in Britain's plans for ensuring national oil supplies. In 1944 he was a member of the British Oil Delegation which visited the United States to discuss an Anglo-U.S. oil agreement.

When the operations in Persia of Anglo-Iranian Oil were suspended in 1951 owing to the dispute with the Persian Government caused by Persia's oil nationalization law of that year, his major preoccupations were the various efforts made to settle the dispute in 1951, 1952 and 1953, and the reorganization of the company's business necessitated by suspension of its operations in Persia. In 1954 he played a leading part in the formation of a consortium of Anglo-Iranian and other international oil companies, which in November 1954 settled the dispute and recommended the operation of the Persian oil industry.

Basil Rawdon Jackson, who becomes chairman, was born at St. John's Newfoundland, in May 1892, the third son of the late Sir Henry Jackson, former governor

(*Continued on page* 78)

Petroleum at the 20th Soviet Congress

Crude oil production in Russia has nearly doubled during the 1950-1955 Five-Year Plan, to about 1,390,000 b/d during 1955, but its geographical distribution has worsened. The new Five-Year Plan will be discussed in detail during the 20th Congress of the Communist Party, starting in mid-February. The Sixth Plan contemplates a production of about 2,500,000 b/d in 1960.

By George Rosu

FROM the 14th party Congress—held in December 1925—on, all Soviet Party Congresses divided their attention between political strategy and economic planning. The 20th Congress, to open next February 14, in Moscow, will make no exception. Its first duty will be to acclaim the recent Soviet endeavorings in Asia to "break the chain of imperialist alliances" which surrounds the "camp of peace and democracy." But after the clamor has settled down, the Congress will have to face economic problems of an unusual caliber.

As a matter of course, it will start by taking stock of the results attained during the 1951-1955 plan-period which, according to official data, present this picture:

	1950	*1955*
Crude oil, mil. of barrels	275	508
Coal, mil. of m. tons	272	390
Electric power, bil. of kwh	85	156
Pig iron, mil. of m. tons	20	33
Crude steel, mil. of m. tons	28	45

At the end of 1955, the output of production means was 85 per cent higher than five years ago; but nothing is mentioned about the production of consumer goods. The impressive results achieved in the heavy industry sector are due to massive investments which were twice as high as those made during the 1946-1950 plan.

As its next task, the 20th Congress will have to approve the directives for the sixth Five-Year Plan (1956-1960). However, 1956 is not only the beginning of the sixth Plan but the turning point of a new phase in Soviet planning. In the years ahead, Russia will have to solve far greater and more different difficulties than during the past quinquenia, springing not from one but from seven parallel plans, to wit:

1) the traditional Five-Year Plan;

2) The long-term Plan, directed by the former Oil Minister, Nikolai Baibakov, through which targets have been set to be fulfilled during the next 10 to 20 years by each main heavy industry sector;

3) the atomic plan, directed by the former Premier, Malenkov;

4) the electrification plan, launched in August 1950;

5) the plan for cultivating waste and barren lands, behind which is a no lesser authority than that of Khrushchev himself;

6) The plan for a quick modernization of the major industrial plants set forth last July by Premier Nikolai Bulganin—and

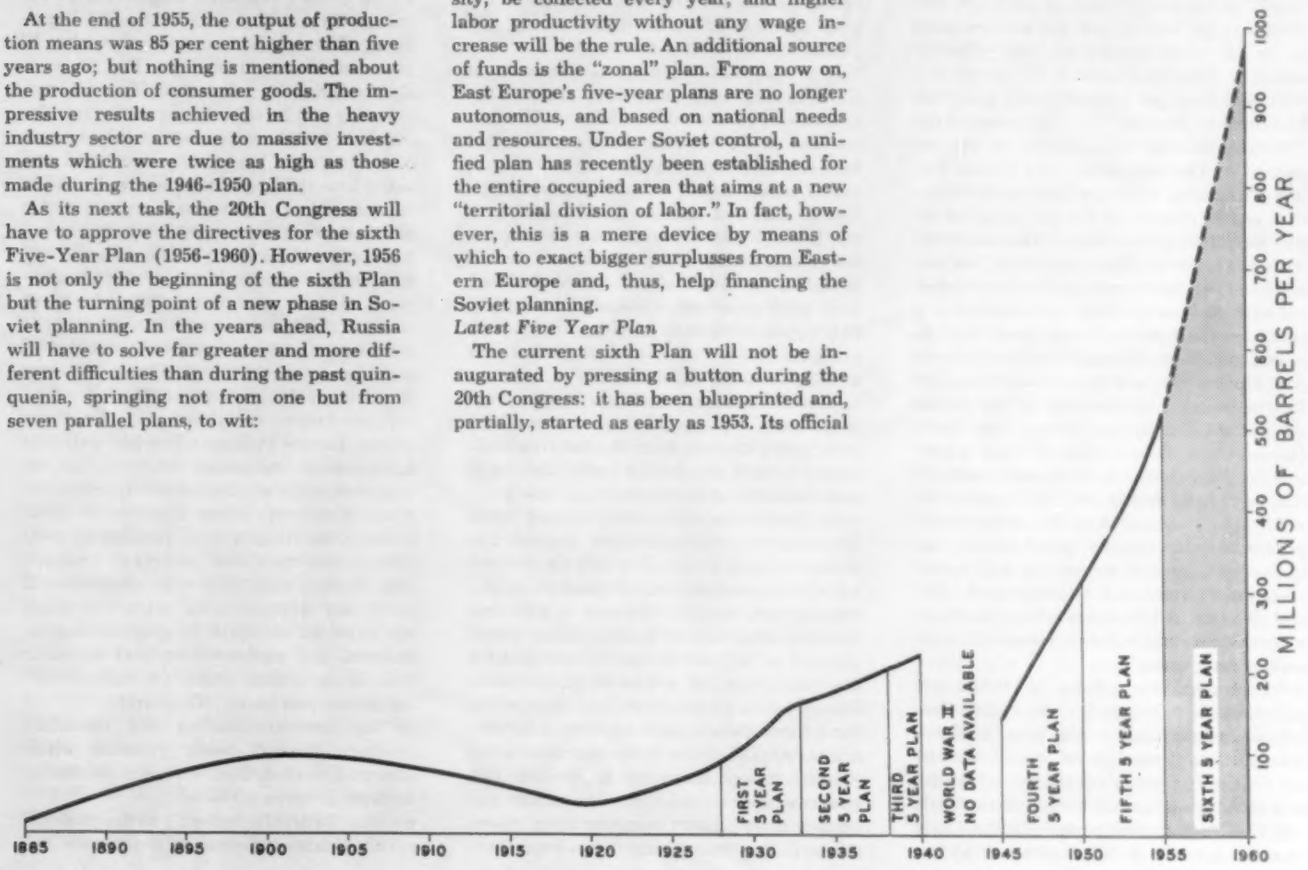
7) the new "zonal" plan which embraces Eastern Europe.

What the pressure of these ambitious plans on the slim Soviet investment rate will mean in terms of living standards for the working class is, certainly, easy to guess. Bigger forced loans will, by necessity, be collected every year, and higher labor productivity without any wage increase will be the rule. An additional source of funds is the "zonal" plan. From now on, East Europe's five-year plans are no longer autonomous, and based on national needs and resources. Under Soviet control, a unified plan has recently been established for the entire occupied area that aims at a new "territorial division of labor." In fact, however, this is a mere device by means of which to exact bigger surplusses from Eastern Europe and, thus, help financing the Soviet planning.

Latest Five Year Plan

The current sixth Plan will not be inaugurated by pressing a button during the 20th Congress: it has been blueprinted and, partially, started as early as 1953. Its official

Russian crude production has increased at a steeply ascending rate in recent years, the current rate being more than three times as great as at the close of World War II when the Fourth Five-Year Plan was begun.



launching took place on April 26, 1954, when the then Premier Malenkov renewed the emphasis on heavy industry, and demanded a higher production without proportionate investments. This fact alone proves how erroneous is the belief that the fifth Five-year Plan had had an erratic course as well as that there ever was a "New Course" in Russia.

From 1953 on, the Government's main concern has been fuels and power. How critical is the bottleneck in this sector is well mirrored in the permanent order issued in 1954 to cut down consumption of fuels in industry, railway and agriculture below even the planned minimum quantities. The energy base has, obviously, become too narrow, and fetters a further industrialization. The major effort during the coming years will therefore be concentrated upon opening up this bottleneck. Russia plans to produce in the near future four times as much electrical power as in 1955. The more distant goal is to create an economical single power grid for European Russia, and another for Southern Siberia.

The second imperative task is to raise coal output beyond the 500 mil. m. ton level, and to expand the underground gazification of coal. Both these tasks, plus a proportionate expansion of the power generating capacity, require such formidable capital outlays that their financing will swallow the biggest share of the investment funds earmarked for the heavy industry as a whole.

Petroleum and natural gas take third and fourth places in this order of priorities. The prospects for finding rich gas sources seem to be far more pessimistic than officially admitted. One illustration is the laying of a 900-miles long gas main to carry gas from Stavropol to Moscow. The expansion of the "Western Donbas" relies mainly on the gas sources of Transcarpathia (the former Polish provinces), while the Leningrad industrial center thrives on the gas supplied by the Estonian shale mines. The intensive search for gas in Siberia has not yet resulted in any strike worthwhile developing.

As to the petroleum industry itself, a look over the past five years shows that its geographical distribution has been worsened during the last Five-Year Plan. The The main point of attention of the Soviet oil officialdom was the Volga-Urals Basin (the so-called Second Baku). As a consequence, its output soared from a mere 75 mil. barrels in 1950 to 240 mil. barrels last year, or to 47 per cent of the entire Soviet production. Its sudden development has created problems of processing and transportation that are still bedevilling the Soviet planning. All the other oil regions have, comparatively speaking, recorded only modest progresses.

At present, the producing fields and processing installations are, more than ever before, concentrated in the area of European Russia: it now yields no less than 87 per cent of the whole oil output, while the vast Siberian space eastwards from Urals and the Caspian Sea to the Pacific Coast produces a mere 66 mil. barrels, or 13 per cent of the total. The geography of oil consumption, is, however, far different from that of the present production. As a result, at least 100 mil. barrels/year of products must be transported from European Russia to Siberia to quench the latter's rationed consumption. A simple look on the map will reveal how difficult it is to solve the problems raised by this oil transportation over thousands of miles overland. The first task of the new plan in this domain is, therefore, to tackle the geographical distribution of liquid fuels, and create a more economical balance between oil production and consumption.

Siberia's oil needs are growing at a fast step. They have soared by millions of barrels practically over-night as a consequence of the plowing up program of waste and barren lands. A second push in demand has been caused by the construction of a new industrial center in Southern Siberia which, so far, has only the rudiments of a fuels and energy base.

The petroleum sources of Soviet Asia cannot cover these new demands. The oilfields of Kazakhstan, Uzbek and Turkmen may increase production over the present modest levels only after important capitals has been invested to tame the wilderness of these republics. As funds are scarce, the bets are against a great increase in the production of these fields in the near future. At the other extreme of the continent lie the limited oil deposits of Sakhalin, the output of which rose only by a modest percentage since the last war. Therefore, the only solution left is to discover new deposits, and to develop them quickly.

It is true that two projects, presently in construction, may somehow relieve the pressure of oil demands in Siberia. The first consists of an 800-mile long pipeline laid between Tuimazy and the Omsk refinery, and is meant mainly to solve the consumption problems of the newly cultivated barren lands. When the work now in progress for enlarging the Orsk installations, and to complete the Omsk plant, will be finished, their production will diminish the necessity to bring into this area large quantities of oil products by rail. The second project has only started, but its ambitious proportions aim at covering all fuels and energy requirements of South Siberian industrial region which extends from Novosibirsk eastwards beyond the Baikal Lake. The large coal deposits of Kemerovo and the Kuznetsk Basin, the new mines opened up at Cheremkhovo, and additional deposits believed to exist in the Novosibirsk, Irkutsk and Chita provinces are planned to be developed very quickly. This coal will become the raw material for several large plants planned to be built in the Irkutsk area for the production of synthetic liquid fuels. Cheap hydro-electricity will be supplied by the Irkutsk power plant as well as by two additional plants now in construction on the Angara River. However impressive this plan may appear, there is no hope that oil-from-coal will start running from these plants during the current Five-Year Plan.

Parallel with these projects, prospecting for petroleum has been carried on on a large scale in the rest of Siberia since 1952. Extensive geological and geophysical search was completed last year east and south of the Urals. The magnitude of this task may be sized by the hundreds of experts who teamed up to carry out this project. Although no tangible results are visible yet, officially it is claimed that the search was successful. It is further claimed that the success was due mainly to new prospecting methods perfected by Soviet scientists. One of them is the electro-prospecting method using the alternative electro-magnetic waves, naturally or artificially generated in the earth. Another were the high-frequency seismic method which is claimed to be successfully used in prospecting for oil and coal. According to a few hints which found their way into print, actual drilling has started only in the southeastern parts of Yakutsk, and in the Novosibirsk Province. It is, however, too early to attempt an assessment of these deposits.

While Siberia's development will take the biggest share from the funds appropriated for the oil industry, the other oil areas will have to content themselves with less, even to create large profits out of which to finance the big Siberian venture. Into this category fall the former Polish oil fields, the Volga-Urals Basin and, particularly, the Azerbaijan region.

In the Old Baku area, the Ministry of Oil Industry has failed, year after year, to fulfill its drilling plans. Its importance in the overall Soviet oil picture is steadily diminishing. There is even a rumor that, after 80 years of shining glory, the Old Baku is slowly fading by exhaustion. This assumption may still be subject to questioning. The indelible fact, however, is that the pressure of the deposits has greatly decreased and many low-yielding compressor wells had to be changed to depth pump operation. Air and gas pressure recovery methods are being applied but only on a reduced scale, still the planned results do not materialize. Instead of more new wells, Old Baku must content itself with more reactivated wells from among those exhausted, accidented and abandoned years ago. Their yields are, of course, far from comparable.

According to the decision of the Communist Party's Plenum taken last July, the conventional extraction methods are no longer thought as admissable: they use too much metal of which there is a great scarcity, and then a great number of wells affects adversely the reservoir pressure. The decision calls for a wide application of three new methods in oil extraction which are expected to result in great savings of material and equipment and, at the same time, in far higher profits (through lowering production costs). They are:

a) The "contour flooding" e.g. secondary recovery through water pressure which dispenses with drilling a higher number of wells to produce a field;

b) The "hydraulic breaking of the stratum" which creates differences of pressure be-

Offshore wells in the Caspian Sea are connected by pile-supported roadways over which trucks may be operated to service operations. In the Neftyanye Kammy field even the workers' housing has been built over the water.

tween the reservoir and the well by injecting into the deposit crude oil, residues or comparative viscous liquids at 200 to 300 at. pressure;

c) And the drilling of wells with a wider diameter which permits a freer flow and increases the output per well.

The slogans adopted for the current oil plan call for: more oil surfaced by the gusher method, more wells switched to water and air pressure, a serious study for overcoming the clogging of wells and, particularly, repair, reconditioning and reactivation of old wells applied on the widest scale. In brief, the Party's decision of last July calls for a smaller number of new wells, higher output per well and lower costs. These goals are aspired to by all oil enterprises, no matter where they operate. The question is whether Russia will be able to overcome the many critical shortages which have been slowing for a long time the efforts of her petroleum industry.

Parallel with the blueprint of the sixth Five-Year Oil Plan, the Soviet "superstructure" underwent a series of transformations, and appears to be now braced for the forthcoming tasks. On May 18, 1954 the USSR Petroleum Ministry was split into the Union-Republican Ministry of the Oil Industry of the USSR, and the Union-Republican Oil Ministry for the Azerbaijan ASSR, with seats in Moscow and Baku, respectively. The latter is in charge of the Caucasus oil industry while the former will concentrate its attention mainly upon the Siberian venture and upon patching up the many loopholes of the processing industry. At about the same time, the USSR Ministry of Constructions of the Oil Industry was reorganized, and its competence extended over wider fields. As early as September 1953, all geological activities were concentrated in a new Ministry of Geology and Protection of the Mineral Raw Material Base of the National Economy.

This reorganization has not obtained, however, in uprooting the deeply ingrained bureaucratic evils; hence the war against them is still on. The late USSR Petroleum Ministry was an octopus with over 500 administrative offices, sections, and branches, and its hierarchy was based on the proportion of one bureaucrat for every 2-3 workers in the field. This enormous apparatus caused parallelism, confusion and critical delays in decisions concerning operations in the fields. Some recent complaints in the press suggest that the new set-up has inherited the sins of the parental source.

The USSR Academy of Sciences has, during the last three years, taken over more and more tasks connected with the oil industry. And this is true also about the Republican Academies of Sciences which perform now practical tasks for the local petroleum industry. A Commission for Giving Scientific Assistance to the Oil Industry has also been established by the end of 1953. Soon afterwards, all technicians and research workers have been merged into the Oil Industry Scientific Research Society whose aim is to mobilize all competent forces for helping the oil production. Finally, a year ago, the USSR Academy of Sciences has centralized in its hands all petroleum research activities, and is now guiding them from a central position. The Academy founded also a Central Institute of Scientific Research for Mechanization with a view to improving working methods.

U.S. REFINING PATENTS

Light and Middle Distillates

by Heinz Heinemann

Each year are issued many U. S. patents which are of very real interest to the petroleum refiner, but which cannot be readily classified into specific process groups and which are therefore not discussed in the patent reviews of process groups. Similarly, there are some important processing methods, which are not separately reviewed because there are only a few patents referring to them. It is the purpose of the current review to digest typical patents of these classes and particularly patents which have issued since the period covered in the 1955 Annual Review number of World Petroleum or between April and December 1955. Processing methods covered here are related to the refining of light and middle distillates.

Stabilizing of Gasolines—A method for removing gum forming constituents from a cracked gasoline of high octane number, which contains at least 2% olefins is described by P. C. Keith in 2,707,700 (to Hydrocarbon Research, Inc.). No lowering of the mono-olefin content or of the octane number occurs. The gasoline is passed together with hydrogen over a high area activated alumina at 825-900°F, 50-325 psig. pressure and a space rate of 0.5-5 V/V/hr. Some hydrogen consumption occurs. A. A. Draeger (2,721,832 to Esso Research and Engineering Co.) converts diolefins in gasolines also containing mono-olefins and naphthenes by treatment with activated carbon at 450-630°F, 0-200 psig. pressure and a space rate of 0.5-10 V/V/hr. The activated carbon may be promoted with a small amount of a potassium compound to facilitate regeneration by steam or air. Mono-olefins are not affected by this treatment. According to another Esso Research and Engineering Co. patent (2,721,831 L. A. Jennings and B. R. Strickland) cracked gasoline, containing aromatic mercaptans along with olefins and diolefins is treated with a solution of cupric chloride which is free of oxygen. This treatment reduces the gasoline's sensitivity to oxygen. The spent cupric chloride solution is regenerated by oxidation.

Additives—An oxidation inhibitor is the subject of California Research Corp. patent 2,718,501 (O. L. Harle). The inhibitor used in amounts of 0.1-2% consists of a compound selected from the group comprising aliphatic hydrocarbon mercaptans, sulfides and polysulfides having a molecular weight of at least 150 and of 0.03-0.5% of an aromatic amine of the group consisting of phelyl α-naphthyl amine, 2-naphthyl amine, phenothiazine, etc.

E. I. L. Lawrence, R. K. Smith and M. J. Pohorilla in 2,721,121 (to Kendall Refining Co.) disclose an organo-boron composition which is suitable as a performance characteristics additive for gasoline and diesel fuels. This composition is produced by passing a gas containing free oxygen through a normally liquid paraffinic petroleum fraction, boiling in the range 350-800°F, at a temperature of 305-385°F. Available for reaction are 1 to 3 chemical equivalents of o- or m-boric acid per mole of paraffin. The crude reaction product contains about 0.2 wt.% chemically combined boron.

Sediment formation and discolorization of burner oil during storage is avoided by the use of an inhibitor disclosed by V. A. Chenicek (2,717,826 to Universal Oil Products Co.). The inhibitor, S-benzyl isothiourea, is employed in concentrations of 0.0001-1 wt.%. A coking inhibitor for lube oils is discussed in Esso Research & Engineering Co.'s 2,716,089 (E. B. Cyphers and L. E. Moody). It comprises an antimony salt of a dihydrocarbon dithiocarbamic acid. Each of the hydrocarbon portions of the acid has 10-20 C atoms.

Jet Fuels—S. Skolnik and H. W. Kruse (2,712,496 to the U.S. Navy) have patented a fuel mixture comprising 82% aniline and 18 wt.% hydrazine as a jet fuel. A jet fuel containing an aromatic hydrocarbon gum inhibitor is disclosed by H. M. Fox and S. C. Britton in 2,712,497 (to Phillips Petroleum Co.). The fuel conforms to the equation

$$\frac{R-1.344}{0.00152N} \geqq 1$$ where R is the refractory index at 68°F and N is a performance number.

Separation of Olefins—The separation of olefins and diolefins from each other and from hydrocarbon mixtures is the subject of two Esso Research & Engineering Co. patents. In 2,705,698 G. P. Hammer separates C_3-C_5 olefins and diolefins from other hydrocarbons by a series of fractionations of wet and dry gas streams at different operating conditions. In 2,707,716 L. C. Price describes a method for separating isoprene and cyclopentadiene from naphthas also containing butadiene, methylcyclopentadiene, etc. Naphtha is introduced into the upper part of a stripping column. A C_4 rich stream is removed overhead and a C_5 rich stream is removed below the vapor inlet. The overhead stream is introduced into an intermediate part of a second column, into the lower part of which the C_5 rich stream is injected. Isoprene and cyclopentadiene free of C_4 hydrocarbons are removed from the bottom of the second column.

A chemical method of olefin separation is proposed by H. Tramm, N. Geiser and E. H. Kolling in 2,705,734 (to Ruhrchemie). Pure olefins are separated from normally liquid hydrocardon mixtures by separating the mixture into single fractions of the same number of carbon atoms. Each such fraction is then reacted with HCl in contact with an aqueous zinc chloride solution containing more than 50% zinc chloride. Olefins are converted to aliphatic monochlorides and the reaction mixtures formed are then fractionated. Alkyl monochlorides are recovered and HCl is split off to regain the olefin.

Extraction and Separation of Aromatics—The number of patents issuing on this subject has increased steadily, as aromatics production from naphthas by reforming has found general acceptance. R. F. Leary and F. W. Banes (2,718,492 to Esso Research & Engineering Co.) recover pure benzene from admixture with alkanes and naphthenes, boiling in the range 60-85°C. The mixture is blended with a cracked benzene fraction, boiling in the range 60-95°C and containing olefins and acyclic diolefins. The blend is subjected to extractive distillation with a phenol solvent under conditions, which maintain 2-8 wt.% olefin with the benzene. The benzene is then stripped from the phenol solvent with these olefins. J. L. Olsen (2,716,144 to Sun Oil Co.) proposes to separate aromatics from naphthas in the gasoline and kerosine boiling range by percolating the naphtha over silica gel to adsorb the aromatics. An essentially aromatic desorbent, boiling below 500°F and outside the boiling range of the feed, is subsequently charged to the gel to displace charge hydrocarbons. A further quantity of charge fraction is then fed to the gel to start a new cycle. During a portion of each cycle, the effluent comprises non-aromatic charge hydrocarbons in admixture with aromatic desorbent, while during the remainder of the cycle it comprises the aromatic charge in admixture with desorbent. The desorbent may be recovered by distillation.

Extraction of aromatics is practiced according to two patents. In 2,713,552, A. P. Lien and D. A. McCauley (to Standard Oil Co. of Indiana) contact a mixture of aromatic and saturated hydrocarbons at 0-160°F with an anhydrous liquid agent containing at least 200 vol.% (based on aromatics) of hydrogen fluoride and 0.8 to .5 moles of silver fluoride per mole of aromatic. Raffinate and extract phases are separated and aromatics are recovered from the extract in about 98% purity. R. O. Shelton and G. H. Dale (2,724,682 to Phillips Petroleum Co.) employ sulfur dioxide as solvent. Their invention rests in the use of a paraffinic or naphthenic hydrocarbon type of stripping oil in conjunction with liquid sulfur dioxide as solvent. The ratio of stripping oil to sulfur dioxide is closely controlled in the various process stages.

Another solvent extraction process is disclosed in Phillips Petroleum Co.'s 2,717,229 (R. A. Findlay). The process comprises concomitantly solvent extracting a gasoline stream and a gas oil stream for separating aromatics therefrom. The gasoline is ex-

(*Continued on page 86*)

Fig. I

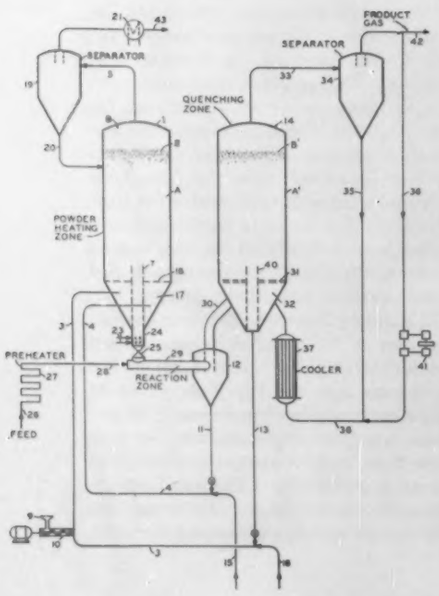
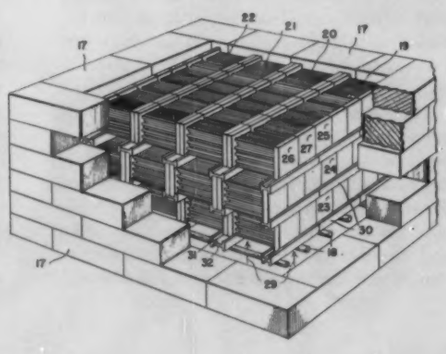


Fig. II



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British Oil News

By E. Lawson Lomax

There was little major change in the set-up of the British oil industry during the past year, but there was a considerable amount of activity both in the industry itself and arising from the industry.

Consumption of petroleum products rose by about 11 percent over 1954. A large amount of this increase was due to the change-over from coal to oil burning in some industries. In addition, certain of the new large power stations have been designed with a view to fuel oil being the main source of heat rather than coal; the price of oil based on calorific value approaching partly with regard to coal. Various schemes were developed in 1955 for the production of town gas from petroleum at the expense of coal. The early part of the year saw an increase in the production of petroleum-base greases, when the grease plant of Mobil Oil Co. at Birkenhead went into full operation.

Petrochemicals increased and large scale manufacture of "Terylene", a petroleum based plastic of the same composition as "Dacron", was begun by Imperial Chemical Industries, Ltd. The major oil companies are producing petroleum alkylates to be used as basic materials in the plastic industry and also as blending components for the production of high octane aviation fuel. Plant is being erected also for the production of ammonia both liquid and anhydrous from petroleum gases, with the ultimate production of nitric acid, nitrates and nitrogenous fertilizers.

The production of indigenous crude oil rose slightly during the year to about 1,200 b/d, the increase being mainly due to the development of the new Plungas field. Incidentally, the D'Arcy Exploration Co., the prospecting company of British Petroleum Co. Ltd. announced during the year, that it has passed the one million foot mark in its drilling for oil in Britain.

A new tanker building program was inaugurated in the latter part of the year by the major oil companies and certain shipping industries. The P & O, which to date has been a passenger and dry cargo line, is also entering into the tanker industry and has placed orders for its first tankers. The record size of tanker afloat was reached on Dec. 2, when the 47,750 dwt tanker "Spyros Niarchos" built at the Barrow-in-Furness yard of Vickers Armstrongs Ltd. to the order of Stavros S. Niarchos was launched.

Other events of interest were the decision of the nationalized railways to embark on a large program of dieselization, and on the government's decision to embark on an increased road building program.

In sum, the past year was a prosperous one for the petroleum industry in general and that the prospects for the year 1956 are equally good.

Expansion of BP's Research Facilities

British Petroleum Company's research station at Sunbury, Middlesex, is being considerably expanded. A new laboratory for the testing of motor fuels was completed, a feature of which is the chassis dynamometer room, in which practically any road driving condition in any part of the world can be simulated, including wind velocities of up to 90 mph, temperature up to 120°F, and the highest stages of humidity.

Purchases of British Petroleum Equipment

Orders for material and equipment for the first three quarters of the year were over £93 million. Orders in the third quarter total £29.7 million of which the largest amount was for tubulars, pipe fittings and valves (ferrous and non-ferrous) with £4,866,437; followed by specialized equipment for oil drilling and production including oil casing, tubing, etc. with £3,412,334; bulk chemicals, catalysts, barytes, etc. with £3,887,606 and machine and hand tools welding and miscellaneous machinery and stores with £2,971,623.

Tanker News

Lloyd's Register of Shipping states that the world total of tankers has increased by 1,832,000 tons since 1954 and now amounts to 26,455,000 tons gross, representing 26 percent of all steamships and motorships as compared with 25 percent a year ago. The figures for 1939 were 11,586,000 gross tons and 17 percent.

The Furness Shipbuilding Co. announce that the 32,000 dwt single screw turbine driven tanker "Samuel Ugelstad" built by them to the order of S. Ugelstads Rederi A/S of Norway, was successfully launched from their Haverton Hill shipyard on Dec. 15, 1955. The vessel's principal dimensions are: length overall about 661 feet-7 inches; depth molded 45 feet 6 inches; speed 15.5 knots.

Messrs. Hall, Russell & Co. Ltd., Aberdeen, announce that the 2,300 dwt single screw, steam driven liquid bitumen tanker "Esso Preston" built by them to the order of Esso Petroleum Co. Ltd. was successfully launched from their Aberdeen Shipyard on Dec. 14, 1955. Specifications are: length overall, 299 feet; depth molded, 20 feet 9 inches; service speed, 10.5 knots. To keep the cargo fluid, two inch diameter steam heated coils are provided in the tanks in the ratio of one square foot to every 14 cubic feet of cargo.

The last of the series of ten 16,000 dwt tankers to be built for the Lowland Tanker Co. in which British Petroleum Co. Ltd. has a 50 percent interest was launched from the Sunderland Shipyard of J. L. Thompson Ltd. on Dec. 29, 1955.

Royal Dutch Petroleum's Annual Report

The board of directors and the managing directors of N. V. Koninklijke Nederlandsche Petroleum Maatschappij (Royal Dutch Petroleum Company) have decided to pay an interim dividend in respect of the financial year 1955 of six percent in cash.

The earnings (subject to audit) of the Royal Dutch/Shell Group of companies for the nine months to September 30, 1955 were £113,459,000, compared with £99,327,000 in 1954.

From these earnings interim dividends have been declared in respect of 1955 to the parent companies, namely Royal Dutch Petroleum Company and the "Shell" Transport and Trading Company Ltd., of pounds sterling 10 million of which Royal Dutch will receive 60 percent.

Record Commonwealth Oil Output

Oil production in the British Commonwealth during the first nine months of this year totaled more than 19 million metric tons (about 380,000 b/d) which, according to Petroleum Information Bureau, is easily the highest output attained over any nine months. Total for the corresponding period for 1954 was about 16 million tons. The greater part of the increase came from Canadian oil fields, whose output of well over 12 million tons was nearly 3 million tons higher than in the first nine months of 1954.

British Borneo and Trinidad, the next most important Commonwealth producers, showed little change over their level of output during the first nine months of 1954, which amounted to 3.6 million tons and 2.5 million tons respectively. Production in India, though still comparatively small, showed a rise of about 30 percent to total over 250,000 tons during the period January-September 1955.

Despite the steady increase in Commonwealth production—which is already equal to more than five times the level of 1946 output—the search for new sources of oil is being vigorously pursued. Besides exploration in countries where oil is already being produced, there has been an extensive search in many other parts of the Commonwealth, including Papua, Nigeria, East Africa and Australia.

Lawrence Appointed Caltex Director

Arthur B. Lawrence, Jr. has been appointed a director of Caltex Trading and Transport Co. Ltd. and managing director of its trading division. Mr. Lawrence has also become a director and managing director of Caltex (U.K.) Ltd. and Caltex Lubricants Ltd. These companies have their principal offices in London. Per A. G. Kylberg has been elected general manager of Caltex Oil A.B., in Sweden.

B.P.C. Drilling Rig at Plunger, Leicestershire

B. P. Adds To Danish Holdings; Starts Work On New French Plant

British Petroleum Co.'s affiliated company in Denmark, BP Olie-Kompagniet A/S, has purchased the stock of the Jansen Brothers' oil plant, largest Danish company owning service and distribution stations. These in addition to the BP Olie's stations will make the British-Danish company the largest owner of petrol stations in the Copenhagen district.

Work has been commenced on the erection of a bitumen producing plant at the Dunkirk refinery of the BP Group in France. The daily capacity of the plant will be 400 to 700 tons of bitumen according to grade, various grades being scheduled for production. The plant, which is due to be commissioned in late 1956, will supply internal markets in France.

Financial Statements

London and Thames Haven Oil Wharves, Ltd. announced that the result of their offer of 2,166,666 ordinary shares of 4s. each, for subscription at 10s per share, is that acceptances totalled over 97 percent of the shares offered. Applications for additional shares amounted to 19 times the number of shares available.

At a meeting of the board of Apex (Trinidad) Oilfields Ltd. held on Dec. 7 it was resolved to recommend a final dividend of 1s. 5d. free of income tax per 5s. unit of stock making a total dividend for the year of 1s. 8d. free of income tax per unit of stock (1953/54 1s. 6d.).

At the 46th Annual General meeting of Kern Oil Company Ltd. held on Dec. 16 in London, C. W. Ivey, the chairman, in moving the reception of the report said: In my statement circulated to stockholders with the annual report, I mentioned that negotiations were in hand for the disposal of the lease of Kern House. I am now able to inform you that the Agreement for Sale, which is on favorable terms, has been signed and completion is to be at Christmas.

Personnels

R. E. V. Jelliffe has been elected a director of E. A. Gibson & Co. Ltd., London, tanker chartering agents. Mr. Jelliffe has been a deputy director of the British Admiralty in charge of the branch dealing with fuel oil. D. W. Wright, formerly manager of Gibson's oil department and C. F. Matthews, another long-time associate, have also been made directors. G. N. Cawthorne, formerly assistant to Mr. Matthews, has been appointed manager of the tanker chartering department.

Dr. R. B. Killingsworth, Ph.D., F. Inst.P. who has been manager of The Mobil Oil Co. in Britain technical department since 1952 has returned to the U.S. and has been succeeded by G. A. Dickins, B.Sc., A.R.I.C., F.Inst.P. Other appointments taking effect on Jan. 1, 1956, were a new position sales manager (automotive), filled by T. R. C. Tompkins.

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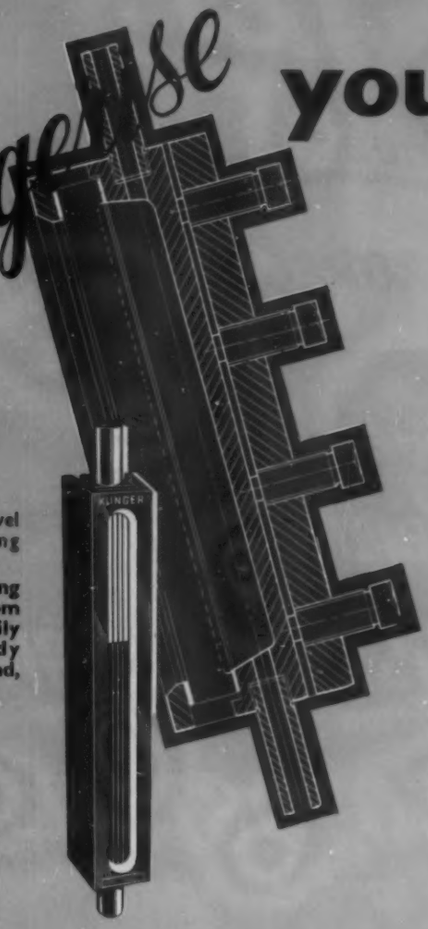

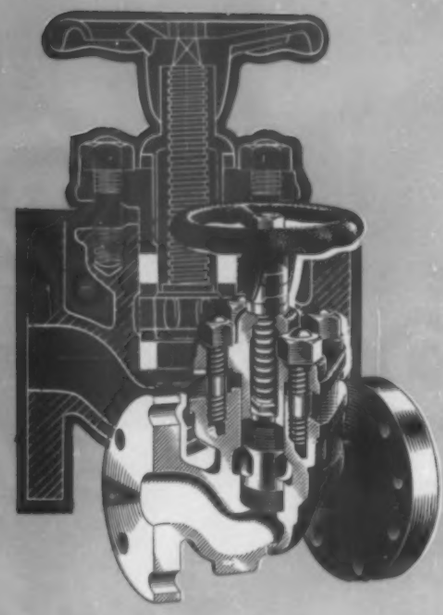

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The Klinger Seatless Piston Valve operates on an entirely different principle from the usual type of seating valve. It consists basically of a finely ground piston, operated by the valve spindle and hand wheel, and moving through two or three non-metallic resilient valve rings, capable of resisting steam, oil and most fluids at high temperatures and pressures, and separated by a ported lantern bush. It is made in a great variety of sizes and designs, to suit all purposes, and has the following advantages:—

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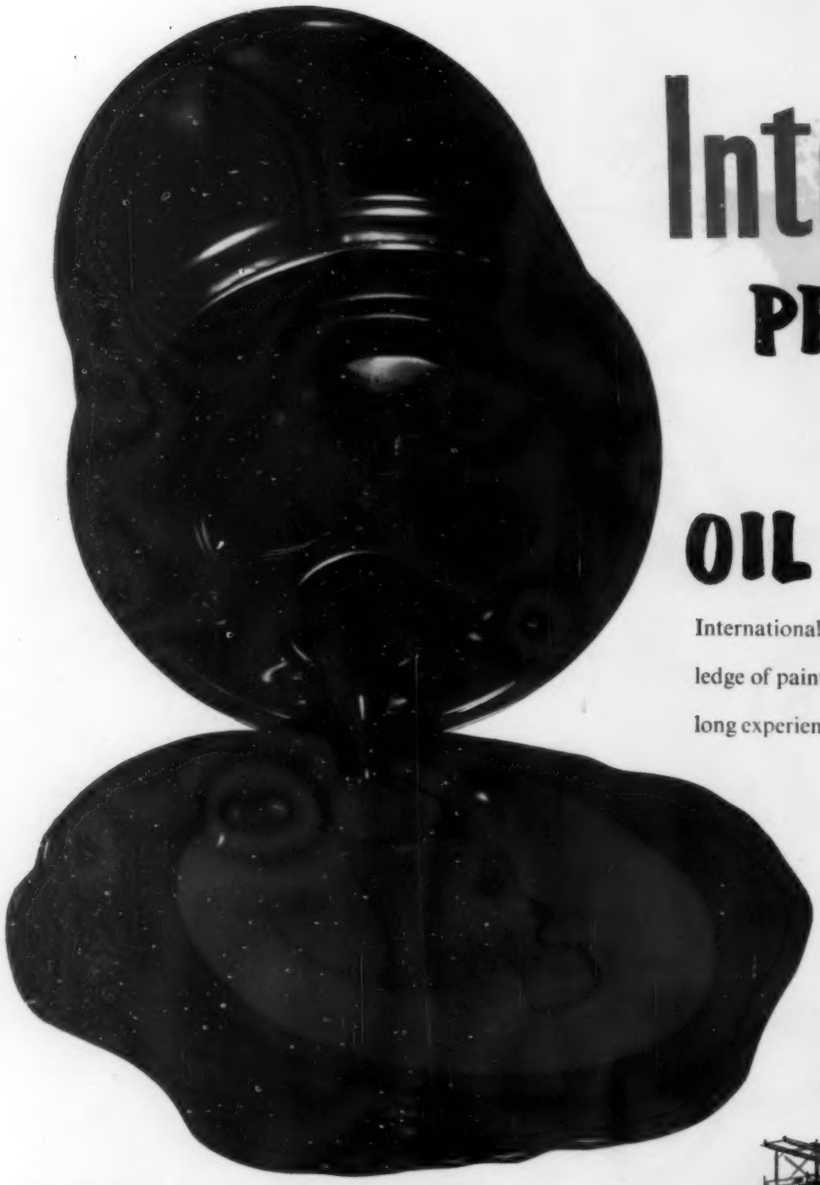

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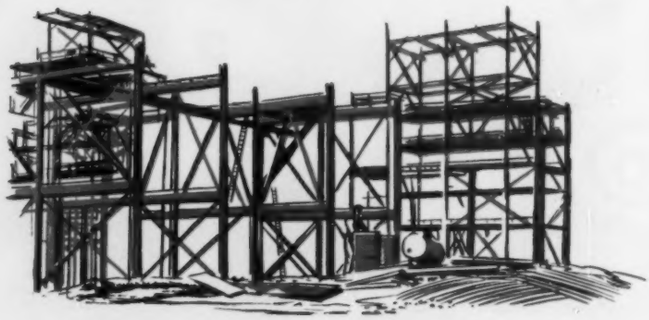
Made from genuine red lead and selected graphite. The leafing effect of the graphite pigment makes this primer dry with an exceptionally strong film of uniform thickness. This means that structural steelwork, storage tanks, gasholders, etc. can be properly painted even by semi-skilled labour.



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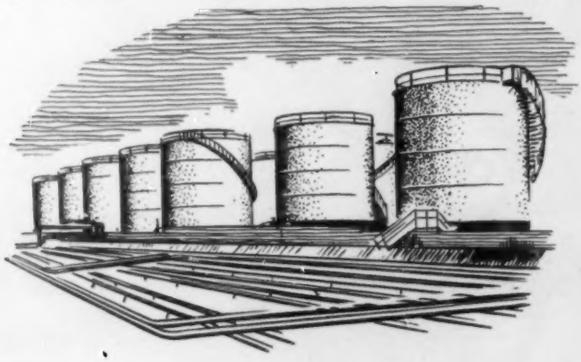
Has exceptional leafing properties, forming a firm metal-like protective film. The very high light reflection of this paint makes it ideal for external coatings of storage tanks and pipelines. This aluminium paint does not evaporate in storage, and with International's duplex containers—in which the aluminium paste is kept separate until needed—International Aluminium Paint retains its lustre for a considerable length of time.

If you would like further details of this or other International specialities for the oil industry, please let us know.



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Canadian Notes

Schlumberger Personnel Changes

L. G. Chappell, formerly Eastern Division manager at Regina, has been moved to Edmonton as manager of the Western Division of Schlumberger Well Surveying Corp. He will be assisted by W. W. Shoquist, who has been moved to Edmonton from the Calgary District. L. V. Carson will replace Mr. Shoquist as manager of the Calgary district.

B. M. McVicar is the new manager of the Eastern Division, replacing Mr. Chappell. He was formerly assistant to the area manager at Calgary. W. T. Wilson, formerly district manager at Virden, has been transferred to Calgary to succeed Mr. McVicar. A. H. Dorin, who was station manager in Kindersley, has been promoted to district manager at Virden, with W. B. Anderson replacing him in Kindersley.

Magcobar Names McBrien Canadian V.P.

The Magnet Cove Barium Corp., Houston, Texas, has named Wesley W. McBrien vice-president for its Canadian operations. A native of Toronto, Mr. McBrien was the former vice-president and general manager of Canadian Industrial Minerals, Ltd., a barite mining company purchased last November by Magcobar and considered one of the western hemisphere's largest barite mines. It is located in Nova Scotia and is believed to contain several million tons of barite of exceptional quality.

Canada-Cities Service Names Local Manager

Don Anderson, of Calgary, has been named local manager of operations for Canada-Cities Service Petroleum Corp. For the past four years, he has been superintendent of oil operations for the Canadian company. He will now supervise all operations of the company, including production and exploration. In the latter capacity, he will assume the responsibilities of Z. E. Stucky, who is being transferred to another Cities Service operation.

Mr. Anderson has been with Cities Service since 1930 when he was an engineer in the company's Bartlesville, Okla., headquarters. He is a member of the Canadian Institute of Mining and Metallurgy and of the Oil Field Technical Society of Alberta.

Will Supervise Canadian Sales

Gordon Morrison has been promoted to sales manager for operations in the Canadian area of the Baash-Ross Tool Company, Division of Joy Manufacturing Co. Mr. Morrison will have headquarters in the Baash-Ross offices at Edmonton, Alberta, and will supervise his company's sales activities throughout the Canadian oil areas.

Gordon Morrison

G. L. Knox, Calgary, president of California Standard Co., was elected chairman of the Board of Governors of the Canadian Petroleum Association at the third annual meeting of that group. Mr. Knox and other elected members of the Board are shown above. Sitting, left to right: C. U. Daniels, G. L. Knox, new chairman, P. L. Kartzke, retiring chairman, George Dunlap. Standing, left to right: D. M. Tyerman, R. A. Cruickshank, V. H. Hunter, Bart W. Gillespie, C. E. Leach, Vern Taylor, T. W. G. Thomson and E. D. Loughney. Not shown are R. A. Bishop and R. C. Brown.

Well Completions For 1956

All signs point to 3,000 wells to complete drilling in 1956, compared to indicated 2,750 to 2,800 in 1955. Pipe, casing and tubing are all said to be scarce, with new deliveries last quarter of 1956, but availability of locally manufactured tubular goods in three prairie mills (two now operating and one under construction) should make supplies adequate for entire drilling program.

Gas Producers' Revenue

Peace River region producers of natural gas stand to gross only about $11 million per year from initial throughput of Westcoast trunk gas line in first two or three years of operation at contracted rate of 303 mmcf/d across border, assuming well head netback of 10 cents per mcf. Net profit of perhaps $2,500,000 split among 25 or 30 companies indicates bulk of immediate benefit for pipe line company and industry at large, with producers getting long payout.

B-A Denies Recent Rumors

Officials of The British-American Oil Co. Ltd. have denied two recent stock market rumors: one, that B-A and Gulf would make a reciprocal exchange of producing properties in Canada and U.S.; the other, that B-A would expand its Clarkson, Ontario, refinery again to tie in with a concurrent extension of the Interprovincial pipe line from Sarnia to the Toronto area.

Dorr-Oliver and E. Long Combine Canadian Operations

Integration of the Canadian operations of Dorr-Oliver Inc. of Stamford, Conn. and E. Long Ltd. of Orillia, Ontario, took place as of January 1, according to an announcement made by J. D. Hitch, Jr., president of Dorr-Oliver Inc. The new organization will be known as Dorr-Oliver-Long Ltd.

Clarence R. Long, presently a director of Dorr-Oliver and president of E. Long Ltd., will be the president of the enlarged organization. Headquarters are located in Orillia with the former Toronto office of Dorr-Oliver and the Vancouver office of E. Long operating as divisional sales offices.

Imperial Plans $115 Million Expenditure In 1956.

J. R. White, president of Imperial Oil Ltd., an affiliate of Standard Oil Co. (New Jersey), has announced plans for $115,000,000 expenditure during 1956, an amount nearly 10 percent over the record $105,000,000 expenditure during 1955. The amount will be divided almost evenly, according to Mr. White, between exploration and production, refinery expansion and product improvement, marketing and transportation.

Mr. White emphasized that it is the largest annual outlay in the company's history and reflects high confidence in the Canadian economy, especially the increasing part played by oil.

Canadian Crude to California

Petroleum industry history was made in Vancouver in January when 118,000 barrels of Alberta crude were shipped from Vancouver to California. This was the first time Canadian crude has been shipped to that state.

The shipment was made via the Trans Mountain Oil Pipe Line and Tidewater Associated Oil Co.'s tanker, *S.S. Flying California*. Crude was consigned to Tidewater at Avon, San Francisco Bay. The tanker was loaded at the pipe line company's Westridge Dock on Burrard Inlet, Vancouver Harbor, a tankship and barge loading dock with a 24-inch dock line with friction tube arrangement to control delivery rates from 2,000 to 20,000 barrels per hour.

Trans Mountain's delivery tank farm is on Burnaby Mountain at the 495 to 575-foot level, permitting gravity feed of crude to the marine loading dock and nearby refineries. Trans Mountain officials hailed the Vancouver to California crude movement as an important step in the offshore movement of Alberta crude through their pipe line, but emphasized that this was only a single shipment.

Coal-Fired Gas Turbine Locomotive

It is anticipated that the first coal-burning gas turbine locomotive will be under construction in 1957. Col. R. B. White, chairman of the locomotive development committee of Bituminous Coal Research, Inc., which is now developing a coal-fired gas turbine locomotive, has announced that test work on the turbine is expected to reach completion in 1956.

5 Reasons

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The longer life and lower end cost of Nordstrom and Audco valves have been proven through many years of service in the petroleum and gas industries.

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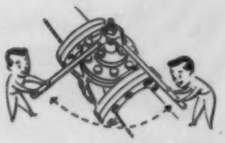
1. ***Pressurized lubricant provides positive shut-off.*** Lubricant sealing is *continuous* . . . it can't be scratched or eaten away like ordinary exposed valve seats. Positive shut-off eliminates costly or dangerous leakage and prevents product contamination on petroleum processing operations.

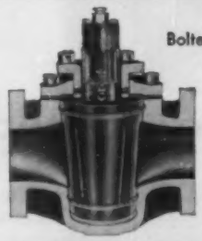


2. ***Quick, quarter-turn, rotary action.*** The tapered rotary plug principle is the simplest, most positive valve action known. The tapered plug maintains an intimate working contact with the seat at all times. Quarter-turn rotary operation is two to five times faster than ordinary valves.

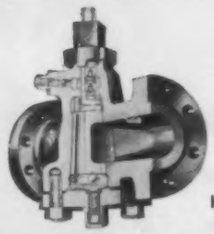
3. ***Lubrication and unexposed seat save repair costs.*** In Nordstrom and Audco valves the seats are *never* exposed to corrosive-erosive material. Any material touching the plug in the closed position is scraped off as the plug is turned back to open. Metal-to-metal wearing friction is eliminated by lubricant on the working surfaces, assuring longer valve life at lower cost.

4. ***Simplest of all valve designs.*** There are only three basic parts comprising standard Nordstrom and Audco valves —body, cover and plug (the only movable member). It is a mechanical axiom that "the fewer the parts the fewer the repairs." Allows operation by inexperienced help.

5. ***Adjust or lubricate under pressure.*** Nordstrom and Audco valves are the only types of valves that can be fully adjusted and lubricated in service. In any operating position, the plug can be jacked from its seat by a few turns of the lubricant screw or by injections with a lubricant gun.

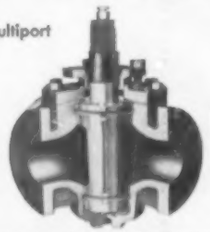


Bolted Gland Type



Hypreseal

Screwed Gland Type



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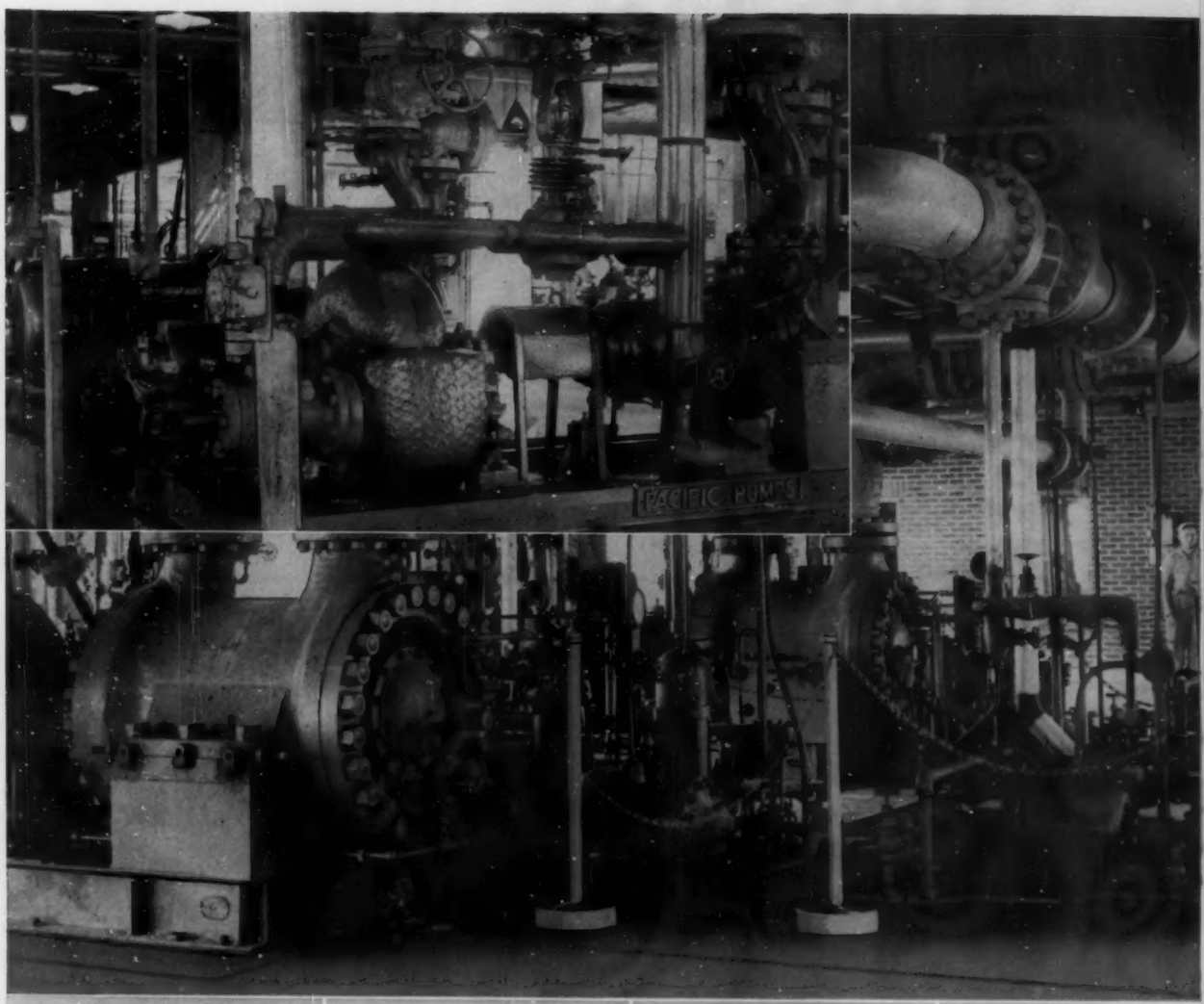

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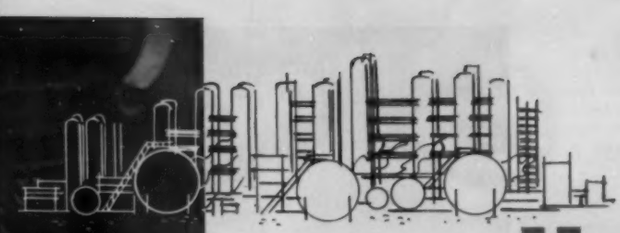

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Handling hydrogen at pressures approaching 1,000 psi calls for compressors that are the ultimate in design, material and workmanship. The fact that 75% of all reforming plants of this type use Clark barrel type centrifugal compressors speaks for itself.

At the upper left, the Pacific pumps are shown in operation moving thousands of gallons of process stock daily.

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Basil Jackson to Become Chairman

(Continued from page 62)

of Trinidad. During the 1914-18 war he served with the Royal Garrison Artillery in France and Flanders and in 1921 he joined the Anglo-Iranian Oil Co. and worked in the production department of the London office until 1929, when he visited the United States. The following year he opened the company's office in New York, and remained as its representative there until 1935, when he returned to London and took charge of the English oilfield operations then being developed.

Shortly after the outbreak of World War I, he again went to New York, and when the U. S. entered the war he was appointed by the Petroleum Administrator for War to be one of the two British representatives on the Foreign Operations Committee. He was responsible for the purchase of all Anglo-Iranian supplies from American sources, including equipment for aviation gasoline manufacture at Abadan, which provided one of the largest plants of this kind in the world, and made an important contribution to allied air operations. After the war, he was closely concerned in the inception of the Middle East Pipelines project, for construction jointly by Anglo Iranian, Standard Oil Co. (N.J.) and Socony-Vacuum of a pipe line from the Persian Gulf to the Mediterranean, and with its concomitant contracts for the sale by Anglo-Iranian of large quantities of oil to these American companies.

Mr. Jackson was appointed a director in October 1948 and returned to London to become a managing director in May 1949, having spent up to that time some 15 years in the United States. He has also visited Persia and other areas of the Middle East.

He succeeded Sir Hubert Eves as deputy chairman in July 1950.

Neville A. Gass, who becomes deputy chairman, served with the Royal Artillery during the First World War and was awarded the Military Cross and the Belgian Croix de Guerre. In 1919 he joined the Anglo-Persian Oil Co. and served in Persia, latterly as deputy general manager, until 1934 when he was transferred to the London office. He has been a managing director of the company since 1939.

The Hon. Maurice R. Bridgeman, who is to become a director, is the third son of the first Viscount Bridgeman. He joined the then Anglo-Persian Oil Co. in 1926. After two years in Persia he worked in the company's London office until the Second World War, except between 1934 and 1937 when he was the company's New York representative. During the war he filled various government positions connected with petroleum. He rejoined The British Petroleum Co. in 1946.

1955 Premium Octane Ratings 1.8 Higher Than 1954

Gasoline on sale at service stations in December closed out the year with an average octane number of 96.1 for premium and of 88.9 for regular on a national weighted basis, according to the latest monthly survey of antiknock quality compiled by Ethyl Corp.

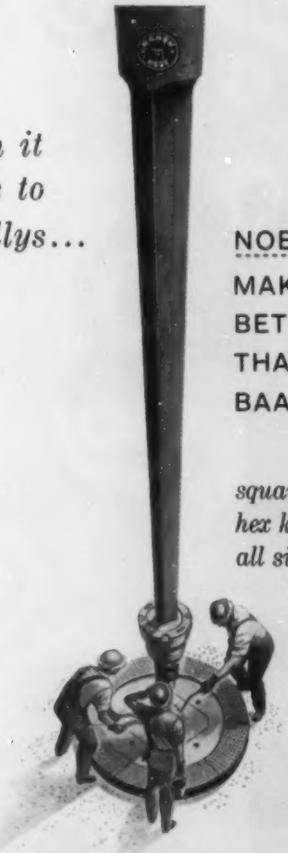
The premium gasoline average was unchanged from November but 1.8 octane numbers higher than in December 1954. The regular gasoline average was 0.1 octane number higher than in November and 1.6 octane numbers above December 1954. The premium average gained in all but three months of 1955 while the regular average increased in eight of the 12 months. Average tetraethyl lead contents in December were 2.48 ml per gallon of premium gasoline and 2.22 ml per gallon of regular gasoline.

M. S. Umbenhauer

Fluor Names New Design Manager

M. S. Umbenhauer has been appointed manager of power plant design for The Fluor Corp., Ltd., Los Angeles, Calif. In this newly created Fluor post, Mr. Umbenhauer will direct the company's technical services to the electric power industry, according to J. S. Fluor, president.

when it comes to kellys...



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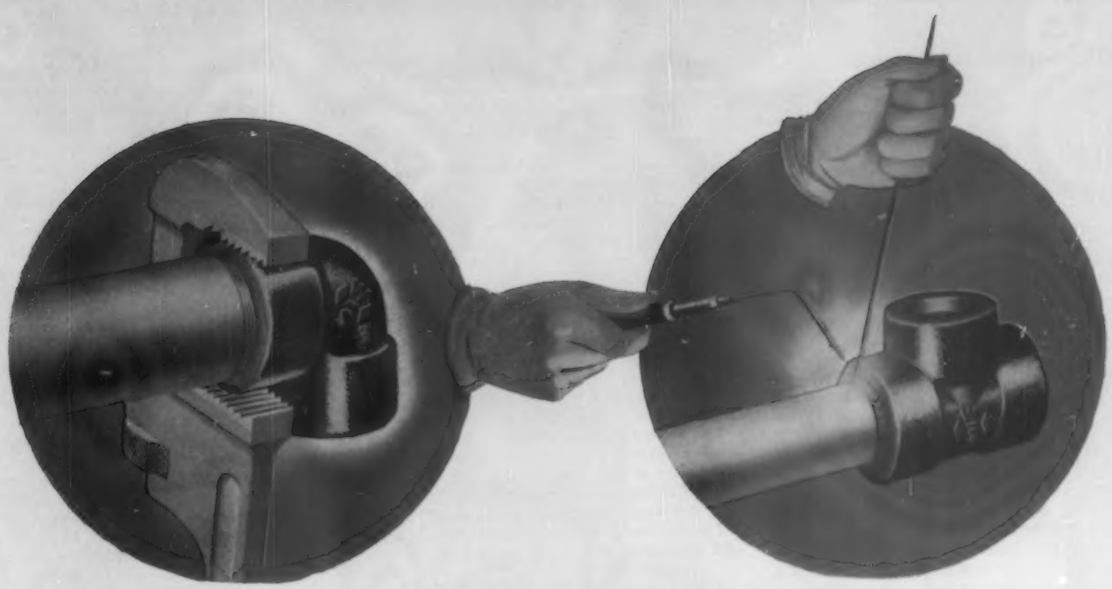

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Latin American Oil News

Oil Developments In Cuba

A 125 b/d well, Jones Bess #2, was completed Dec. 2, 1955 by Ted Jones Drilling Co. at Santa Maria del Mar, 12 miles east of Havana. Pay zone was brown dolomite at 2,510 to 2,542 feet. API gravity of production was 16.5°v. The discovery is just one mile north of the old Bacuranao field. Gas pressures estimated at 2,000 psi caused two blowouts and future wells may be completed for gas sales to Havana.

Cuban American encountered promising oil shows in Cristales #1, located five miles northeast of Majagua in Camaguey province. Three zones were tested, of which the bottom zone, from 1,962 to 1,990 feet, was most promising.

Guatemalan Concessions Remain Unsettled

The passage of the new petroleum law in Guatemala has aroused wide interest, as proved by the fact that 92 concession applications were received in the opening day. Many of the larger U.S. companies were represented (*World Petroleum*, Jan. 1956, p. 68) and the rush caused the government to announce that no new applications would be accepted for a two-month period. An announcement during January indicated that the companies would be asked to try to settle the overlapping applications themselves, rather than resort to government action as provided in the petroleum law.

Brazilian Exploration Progresses; Refined Product Imports Decrease

Brazilian exploration continues in the Amazon Basin with six rigs running during December. A rig was mounted in the State of Rio Grande do Norte on the Apodi River, 32 kilometers northeast of Mossoro. Structures near Mocambo will be drilled in early 1956 and others at Queimadas, Bequimao and Guimares have been located for future work which may include drilling.

The discovery of last spring at Novo Olinda is not a flowing well and is shut in at present, pending arrival of a depth pump. The area is being developed with one rig operating about a kilometer away and another rig being installed during January about eight kilometers therefrom.

Production of crude in Brazil during the first eleven months of 1955 reached 1,990,000 barrels, or 5,959 b/d, compared with 992,000 barrels during entire 1954. This remains insufficient to supply domestic consumption by an extremely wide margin.

Imports of refined products, however, dropped considerably in 1955 due to the increase in refining capacity, which operates on imported crude. Comparing the first seven months of 1954-55, Brazil's imports of crude increased by 1,863,385 metric tons last year, to 1,876,315; kerosine, by 17,372 tons, to 305,993. Imports of ordinary gasoline dropped 583,-979 tons, to 700,205; aviation gasoline, 5,178 to 119,-738 tons; Diesel oils, 50,545 to 619,839; fuel oils, 361,-273 to 1,288,235 tons. Imports of liquefied gas dropped from 120,000 litres per day in 1953 to 7,000 in 1954. Local production reached 368,000 l/p/d in August and September 1955.

The Mararipe refinery in Bahia is to be raised to 37,000 b/d, with work to begin in 18 months. Petrobras has been authorized to use 80 percent of exchange saved by refining in Brazil and now has over US$30 million.

Colombian Production Up

Colombian production increased to 113,351 b/d in November 1955, compared with about 109,500 b/d in 1954. The increase was due to the placing into production of The Texas Co.'s Valasquez field, discovered eight years ago and recently connected with the coast by a 113-mile 12"-pipe line to Barrancabermeja.

Shell Plans Two Venezuelan Projects

Two projects, involving an expenditure of nearly £15 million, are being planned by Cia. Shell de Venezuela.

One, which is estimated to cost about £7.5 million, is the construction of a 20-inch diameter gas pipe line from La Paz oilfield to the Maracaibo district of the State of Zulia and the Cardon refinery on the Paraguana peninsula. The pipe line will total 177 miles in length and will have a capacity of up to 106 mmcf of gas daily. The gas, which is of high calorific value, will be used as the principal fuel in the refinery. It is produced along with the crude oil and when the line is finished will be used economically and will also free fuel oil, presently used in the refinery, for sale and export. Delivery of the pipe will commence early this year and completion of the line is due in 1957.

The second project is the construction of a fourth crude distillation unit at the Cardon refinery, with a capacity of four million tons per year. This will bring Cardon's crude capacity up to 12.75 million tons per year. The plant is scheduled to cost some £7.25 million and is in addition to the cat cracker and alkylation units now under construction.

Changes In Creole's Crude Oil Prices

Creole Petroleum Corp. has announced initial crude price posting at Lake Maracaibo, Venezuela, loading ports, with prices effective as of 7:00 A.M., Dec. 22, 1955.

Anticipating that fully loaded deep-draft tankers will be able to pass through the Maracaibo Bar channel in the near future, the company is quoting prices for La Rosa, Tia Juana Heavy, Lagunillas and Bachaquero crudes at La Salina. To compensate the customer for added expenses, prices are 3 cents per barrel below the postings which were in effect for the same crudes at Amuay and/or Las Piedras. Prices for these crudes at the respective terminals are:

		PRICE, $/BBL. F.O.B. VESSEL	
		Amuay or	
Crude Oil	*Gravity °API*	*Las Piedras*	*La Salina*
La Rosa	24.5/24.9	2.25*	2.22
Tia Juana Heavy	18.5/18.9	....	2.08
Lagunillas	FLAT	2.05	2.02
Bachaquero	16.5/16.9	1.90	1.87

* At Amuay only

National Forms Mexican Company

Formation of The National Supply Co. of Mexico, S.A. has been announced by The National Supply Co., Pittsburgh, world's largest manufacturer and distributor of oil field machinery, equipment and pipe. The subsidiary will have its headquarters in Mexico City and will be managed locally by two vice presidents, Edward M. Gretzler and J. M. Estrop.

The Mexican organization was formed to provide better service on National Supply equipment used by customers in that country, which has become increasingly active in drilling and oil production. Sales to customers in Mexico will continue to be handled by National Supply's export division with headquarters in New York City.

Clark Equipment Announces Formation of International Subsidiary

Clark Equipment Co. has announced the formation of a new subsidiary to consolidate export functions of the firm's operating divisions throughout the world. The new corporation will be known as Clark Equipment International, C. A., and is being organized under the laws of Venezuela.

U.N. Report Estimates Latin American Oil Consumption Increase

A recent report by the United Nations estimates that petroleum's share in Latin American energy use has increased to 74.4 percent in 1952, as compared with 54.5 percent in 1929. The increase is estimated to continue, with total oil consumption increasing annually by 6.9 percent between 1955 and 1965. To supply this consumption, production within Latin America for domestic consumption alone, excluding exports, is estimated by the same source to increase 10.7 percent yearly.

Oil Exploration In Africa

No major oil field has been located in Africa to date, but the pace of exploration is increasing. The Shell-D'Arcy Group has recently completed a comprehensive waterborne seismic survey of all the navigable Niger Delta waterways both in Eastern and Western Nigeria, covering an area of some 14,000 square miles.

This project, which involved the use of a fleet of nine specially equipped boats and took over two years to carry out at a cost of about £200,000, is only part of a total expenditure of approximately £12 million incurred over the past 18 years by the Shell-D'Arcy Group in its search for oil in Nigeria. While small shows of oil have been encountered, none has been found in commercial quantities.

In the British colony and protectorate of Gambia, on the West Coast of Africa, the D'Arcy Exploration Co. (a BP subsidiary) embarked last December on a waterborne seismic survey of more than 200 miles of the River Gambia. The survey will be conducted by Geomarine Service Internationale from their vessel, *Sonic*, which recently completed some similar work in the waters off Abu Dhabi and Dubai in the Persian Gulf on behalf of British Petroleum Co. Ltd. and the Compagnie Française des Petroles. The present survey is planned to last about three months, it being a quicker method in this case than a similar operation on land where dense forests fringe the River Gambia. The land survey will probably be made later, after a study of the results of the waterborne survey have been examined.

Important Development In Exploration Abroad

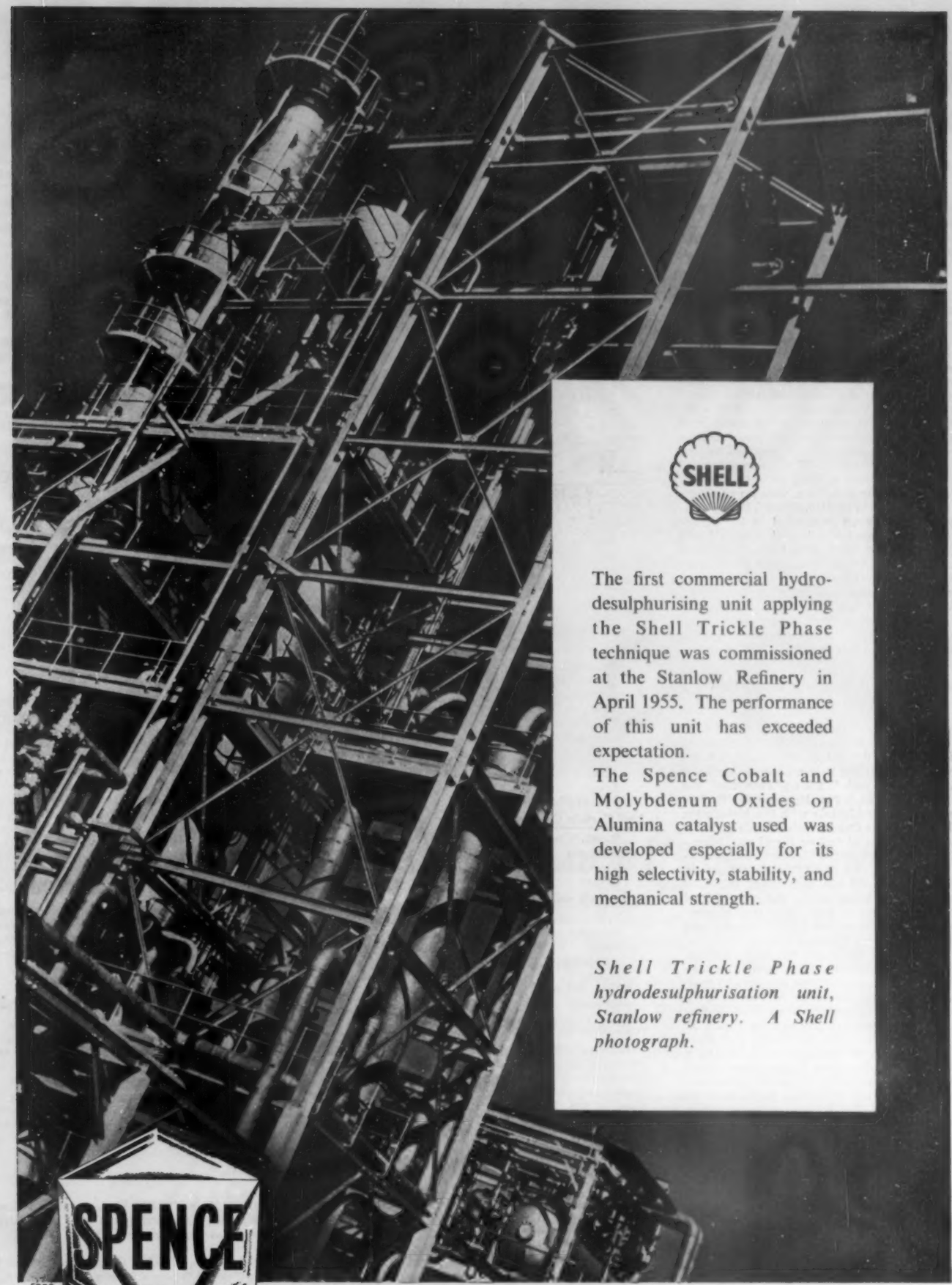
The Government of Venezuela announced Jan. 12 that exploration concession applications were being studied and will be granted "as soon as possible." Estimates are that this will occur during the first half of this year and confidence exists among oilmen that action will be taken, despite lack of any action after previous similiar announcements.

The Venezuelan Hydrocarbons Law stipulates that applicants for exploration concessions may offer "special advantages to the nation" and the announcement contained some general outline of which "special advantages" would be most acceptable.

Among the advantages specified were: higher exploration taxes (present rates specified in the Law are two bolivars per hectare, or 22.2 U.S. cents per acre); higher royalty rates (ordinarily royalty rate specified in the Law is 16⅔ percent); more refining within the country; wider geographic dispersion and spreading of concessions and diversification of oil produced (which would strengthen Venezuela's marketing position).

The Government also said that applicants willing to cooperate fully with the Government in such projects as farming, industry, communications, gas conservation and isotope research would receive cooperation.

President Marcos Perez Jimenez, in making the announcement, stated that additions to Venezuelan reserves were necessary to maintain her world position among oil nations. No new exploration concessions have been granted since 1945 and, due to obligatory conversion to exploitation concessions after a certain time, there are no exploration rights presently in the country. Five companies, however, including Creole, Shell, Mene Grande, Socony and Sinclair, hold large acreage ranging from about three to 1.9 million acres apiece, much of which has not been proved up, and considerable exploration has been performed by the larger holders during past years.



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The first commercial hydro-desulphurising unit applying the Shell Trickle Phase technique was commissioned at the Stanlow Refinery in April 1955. The performance of this unit has exceeded expectation.

The Spence Cobalt and Molybdenum Oxides on Alumina catalyst used was developed especially for its high selectivity, stability, and mechanical strength.

Shell Trickle Phase hydrodesulphurisation unit, Stanlow refinery. A Shell photograph.

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International News and Notes

Continental Changes Name Of Egyptian Subsidiary

Egyptian-American Oil Co., a subsidiary of Continental Oil Co. operating in Egypt, has changed its name to Sahara Petroleum Co. Headquarters for the firm will continue to be in both Cairo and Alexandria.

"The change in name," said Millard K. Neptune, general manager, "was advisable because of the difficulty Arabic-speaking nationals have in pronouncing the word 'Egyptian.' Egyptians call their country 'Misr' instead of 'Egypt.' 'Sahara' is a familiar Arabic word meaning 'desert.' The name 'Egyptian-American'," he added, "also has been confused with the names of other oil companies operating in Egypt under somewhat similar titles."

Sahara Petroleum Co. is exploring for oil in a 60-million-acre concession granted by the Republic of Egypt in 1954 to Conoco, Ohio Oil Co., Richfield Oil Corp. and Cities Service Co. It spudded its first wildcat last summer at a site 28 miles southwest of Alexandria and is now drilling at approximately 10,000 feet in Jurassic limestone, with no commercial oil shows recorded to date. Several highly porous sand members were penetrated in the Cretacious level but all were water-logged. A second well will be begun during early 1956, located southeast of Alexandria in the "strip" concession obtained by Cities Service. This concession was later combined with the Western Desert concession of Conoco and Ohio companies, but the ownership percentage is slightly different, giving Cities Service and Richfield control in the Strip while Conoco and Ohio retain control in the Western Desert.

Increased Oil Storage Facilities At Dakar

Typical of economic developments now taking place in French West Africa is the reclamation of 10 acres of land from the sea at Dakar, carried out with a view to providing new oil storage facilities at this international port. Work on "extending" the African continent was begun last year by Societe Shell de l'Afrique Occidentale with the installation of four large tanks at Dakar, each capable of holding nearly 15,000 tons of fuel or Diesel oils. Meanwhile, the Dakar Port Authorities have built a petroleum wharf at a cost of $1,120,000. Altogether, approximately $2,660,000 has been spent, of which a quarter has been taken up by the cost of land reclamation. Over one million cubic feet of sand have been dredged from the harbor bottom and incorporated in massive breakwaters.

Now, with the new wharf and the Shell facilities, Dakar Port will, at the same time, be able to take two tankers, each of up to 18,000 deadweight tons, to discharge cargo and four ships to load bunkers. The overall aim is to provide unequalled harbor services for South Atlantic shipping by means of efficient and rapid handling of vessels and their cargoes. The cutting of "turn-round" times to a minimum is a major factor, as it is to some extent a matter of choice whether a ship picks up bunkers at Dakar or at, say, Las Palmas or St. Vincent. In South Atlantic traffic, Las Palmas at present leads Dakar in importance as the most used bunkering trade port. St. Vincent is third.

Exploratory Wells Planned In Pakistan

Pakistan Petroleum Ltd. has planned three exploratory wells in the near future. One is drilling in East Pakistan near the side of the Haripur well which caught fire some months ago after going to 7,800 feet. During early 1956 another well is planned near Drig Road in the vicinity of Karachi and another in Khairpur division.

WORLD CRUDE OIL PRODUCTION
(Thousands of Barrels Daily))

	November 1955
WORLD TOTAL	15,753.6
North America	7,240.4
Canada	407.9
United States	6,832.5
Latin America	2,827.5
Argentina	83.8
Bolivia	11.2
Brazil	6.3
Chile	8.5
Colombia	113.4
Cuba	1.4
Ecuador	9.9[p]
Mexico	215.0[e]
Peru	47.3[p]
Trinidad	71.2[e]
Venezuela	2,259.5
TOTAL WESTERN HEMISPHERE	10,067.9
Middle East	3,525.5
Bahrein	30.1
Israel	0.0
Iran	383.0
Iraq	672.0
Kuwait	1,091.5
Neutral Zone	120.6
Qatar	1,041.1
Saudi Arabia	6.4[e]
Turkey	180.8
Europe	180.8
Austria	68.7[p]
France	21.6
Germany (West)	64.0
Italy	5.1[e]
Netherlands	19.6
United Kingdom	1.8
Africa	32.0
Algeria	1.1
Egypt	28.9
French Morocco	2.0
Iron Curtain Countries	1,561.5
Russia	1,375.0[e]
Rumania	150.0[e]
Yugoslavia	5.0[e]
Others	31.5[e]
Other Asia and Australasia	385.9
British Borneo	110.0[e]
Burma	2.6
India	7.5[e]
Indonesia	246.5[e]
Japan	6.3[e]
New Guinea	8.0[e]
Pakistan	5.0
TOTAL EASTERN HEMISPHERE	5,685.7

[e] Estimated. [p] Preliminary. [r] Revised. All estimates from reliable sources within the country concerned. U.S. figure from A.P.I. Iranian figure represents Consortium only. Conversion values correspond to those of U.S. Bureau of Mines, International Petroleum Trade, Vol. 24, No. 58.

Russia Claims 19 Percent in Production

In a report by the Oil Minister of Russia, Mikhail A. Evseyenko, to the Supreme Soviet, Russian production was stated to have increased 85 percent over 1950 and 19 percent during 1955. This would put production at about 69 million metric tons, or about 1,400,000 b/d. The Minister also stated that production in the eastern regions represented 58 percent of total output, compared with six percent before World War II.

Indian Exploration Results Disappointing; Refining Increase Projected

The exploratory program of Assam Oil Co. will be continued despite negative results obtained when the company's ninth and 10th exploratory wells at Nahorkatiya in upper Assam were completed dry at 10,950 and 9,775 feet respectively. The rigs will be moved to new locations for more drilling; meanwhile two other exploratory tests, Naoholia #11 and #12, are drilling ahead.

Concurrently, the Indian Government announced that 300 million rupees (about $63 million) will be allocated to petroleum exploration. Areas to be explored include an aeromagnetic survey of the Jaiselmer area in Rajasthan, Siwalik belt of the Himalayas, parts of the Ganga basin in Uttar Pradesh, the Punjab and possibly the Sunderbans in West Bengal.

The Assam Oil Co. has announced that, pending more favorable results on its exploratory program, a refinery application would be made to the government. The government now estimates that investment in three existing Indian refineries will total about $130 million when complete, contributed 70 percent by foreign capital and 30 percent by domestic sources.

California Standard And Texas Co. Enter Philippine Exploration

After a long quiescent period, exploration in the Philippines is increasing. During 1955, interest was manifested in the country, particularly the Cagayan Valley of northern Luzon Island, where several untouched structures are found. Philippine Oil Development Co., a local concern headed by Col. Soriano, plans an exploratory well in early 1956 in the Cagayan Valley, on the concession acreage which it holds free of any agreement with Standard-Vacuum as exists on other concessions in the area. Caltex is contributing to the drilling expenses.

Recently it was announced that Standard Oil Co. of California (through a subsidiary named California Asiatic Oil Co.) and The Texas Co. (through a subsidiary named Texas Overseas Petroleum Co.) had been granted concessions covering 1,235,000 acres in the Cagayan Valley, in which each will have an undivided half-interest. These areas are in addition to those held by Caltex, which is a joint subsidiary of California and Texas companies.

In addition, Standard-Vacuum, owned equally by Standard Oil (N.J.) and Socony Mobil companies, holds substantial acreage. Two other companies, the San Jose Oil Co. (an American independent) and the Luzon Stevedoring Co., hold acreage as well.

Shell Discovery In British Borneo

An exploratory discovery by Shell at Jerudong has produced 850 b/d on a 3/8-inch choke. A second rig is being moved in from Seria by the discovering company. This is the first important discovery in British Borneo since the end of World War II.

Red Sea Islands To Be Explored

The BP subsidiary, D'Arcy Exploration Co., has obtained an oil exploration license covering the British group of Kamaran Islands and their territorial waters. This group of islands lies off the coast of Yemen, in the southern part of the Red Sea, and is administered by the Government of Aden. Kamaran, the main island, has an area of about 22 square miles. In the very near future, geological, gravity and magnetic surveys are planned to commence over the land areas.

Errata

December 1955, p. 76—Mr. K. L. Le Page is Secretary of Iranian Oil Participants Ltd., not of British Petroleum, as was erroneously stated.

November 1955, p. 79—Mr. Garnik Thomas, an Iranian, is Chief of the maintenance department of the Iranian Oil Refining Co.'s Abadan refinery. Mr. Roth's name was given in error.

Scammell

FOUR AND SIX WHEEL DRIVE TRUCKS

Illustration above shows one of the many 6 x 6 Scammell "Constructor" Oilfields Bed Tractors operating in Kuwait and other major oilfields of the world.

Built to 'take it' *on or off the highway*

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Scammell four and six wheel drive trucks have been specially designed for operation under the most gruelling conditions. In tropical heat, in the Arctic snowy wastes, in soft, sandy or mountainous terrain—in fact wherever the going is rough and tough Scammell trucks provide the complete, economical and reliable answer for every type of oilfield transportation.

Scammell four and six wheel drive oilfield type trucks and tractors have chassis designed for mounting Well-servicing Hoists, Cranes, Excavators, Drill Rigs, Cement Transit Mixers, etc., etc.

Further details gladly sent on request.

SCAMMELL LORRIES LTD., WATFORD, HERTS., ENGLAND *Telephone: Watford 5231; Telegrams: Twelfton, Watford*

Oil Company Staff Changes

WILLIAM S. WOODS JR., has been appointed manager of a newly created finance and corporate stock division of Sun Oil Co.'s treasury department. Mr. Woods' division will include responsibility for cash receipts and disbursements, maintenance of the company's bank accounts, and record keeping with respect to common and preferred stock.

FRITZ G. TAVES, former Pacific Coast area manager of Schlumberger Well Surveying Corp., and recently on the staff of the Schlumberger President, has returned to his former post with headquarters in Los Angeles. Milton E. Loy, former Pacific Coast area manager, has been named Mid-Continent area manager in Tulsa, Okla. Charles K. Ruddick, former Mid-Continent manager, has moved to New Orleans as manager of the Southeast area. Charles A. Doh, former Southeast manager at New Orleans, has been transferred to Houston to take on the newly created position of Manager of Customer Relations.

LUCIEN O. CROCKETT has recently been elected a vice president of Gulf Oil Corp. A veteran of nearly 35 years with the company, Mr. Crockett has been general manager of its chemical department. In his new position he will continue to direct these rapidly-increasing activities of the company.

H. C. McCARVER has been appointed assistant vice president and assistant general manager of Mid-Continent Division of Seaboard Oil Co., Dallas, Texas. Mr. McCarver was manager of the geological and geophysical departments of the Mid-Continent Division prior to his new appointment.

JAN G. SCHAAFSMA has been appointed manager of the laboratories department of General Petroleum Corp. He was appointed assistant manager of the laboratories in 1954 and had been acting manager for the past six months. The company's laboratories are located at Vernon, Calif.

EUGENE BARR, senior geologist for Sunray Mid-Continent Oil Co. in the Wichita, Kans., district office, has been transferred to Denver, Colo., as district geologist. Don Rector, geologist for the company's Tulsa office, has been transferred to the Wichita district office in the same capacity.

NORVAL E. BAKER retired December 31, 1955, after 21 years with the Iraq Petroleum Co. Ltd. and associated companies, during which time he served as chief geologist from 1935 to 1953 and as geological consultant from 1953 until his retirement. F. E. Wellings succeeded him as chief geologist. Mr. Baker expects to continue his interest in petroleum exploration as a geological consultant, serving clients especially interested in the Caribbean and Middle Eastern areas where he has spent a total of more than 30 years in geological exploration and administration.

R. A. HUNTER, A. C. Rall, J. F. Tim, Jr. and Dr. H. D. Hedberg have been appointed Coordinators by Gulf Oil Corporation to assist senior vice presidents in their administrative functions. Mr. Hunter will work in marketing. Messrs. Rall and Tim in financial, and Dr. Hedberg in the production department.

JAMES T. WOOD, JR. has been named vice president for The Texas Co. at Los Angeles, effective January 1. Harris T. Dodge and Frank M. Dawson have been elected vice presidents. Mr. Wood, who formerly was vice president in charge of foreign operations (Western Hemisphere and West Africa), succeeded T. H. Webb, who retired on January 1 after 33 years of service with the company.

Mr. Dodge, general manager of foreign operations (Western Hemisphere and West Africa) since 1954, succeeds Mr. Wood as vice president in charge of the department. Mr. Dawson, formerly manager of the company's purchasing department, is now vice president in charge of the supply and distribution department.

HERBERT S. HAIGHT has been named manager of Shell Oil Company's San Francisco marketing division replacing W. E. McDonald, San Francisco division manager since 1948, who will be on special assignment for Shell on the west coast until his retirement early next year.

Mr. Haight joined Shell in 1928 as a service station attendant in San Francisco and later served as salesman, fuel oil manager, division sales manager in Seattle and Spokane, retail sales manager in Sacramento and assistant division manager in Los Angeles. From 1948 to 1951 Mr. Haight was sales manager of the San Francisco division and most recently has been assistant west coast sales manager. Mr. McDonald joined Shell in 1933, serving as salesman, division sales manager and Oakland division manager before moving to the San Francisco division managership.

J. G. JIMENEZ, of Putnam Park, Greenwich, Conn., has been named marketing manager of Tide Water Associated Oil Co.'s Eastern Division. In his new post he will be responsible for the division's domestic marketing operations including the coordination of all planning, marketing, operating and expansion programs.

SETH W. CANDEE, employee relations supervisor of Tide Water Associated Oil Co.'s Eastern Division, retired in January after having served 30 years with the firm. Mr. Candee started with the company in 1925 as head of the personnel and industrial relations department with the original Tide Water Oil Co. In 1936, when Tide Water Oil and Associated Oil were merged, he was named supervisor of the employee relations department.

RALPH A. CUTHBERTSON has been elected treasurer of Cities Service Oil Co., Pa. Mr. Cuthbertson, previously secretary of the company, succeeds Walter W. Martin, who is retiring after 52 years of service with the company, the last 22 years as treasurer.

THOMAS S. LENNOX has been appointed manager of the Trenton, Mich., refinery of Socony Mobil Oil Co., Inc., succeeding Samuel G. Keller.

CASTLE J. HARVEY, head of Texas Pacific Coal and Oil Co.'s geophysical department since 1953, has been appointed assistant manager of exploration, as of January 1. Paul C. Reed became chief geophysicist for the company on the same date, following five years as geophysicist for Forest Oil Corp. in Midland. Both men will serve in the home office in Fort Worth.

Geophysical Elects New Officers

Cecil H. Green has been elected chairman of the board and Fred J. Agnich has been elected president of Geophysical Service Inc., Dallas, Texas. Mr. Green, formerly president, takes over the position held by J. Erik Jonsson, who will devote his full time to duties as president of Texas Instruments Inc., parent company of the TI-GSI organization. Mr. Agnich, who has been executive vice president, becomes the principal executive officer of the geophysical exploration subsidiaries of Texas Instruments, electronics products manufacturing firm.

GSI and its foreign exploration affiliate companies are conducting geophysical exploration surveys for petroleum and mineral deposits in North and South America, Europe, Africa, the Middle East, Pakistan, India and Australia. New on the GSI staff is David S. Bays, who will act as seismologist specializing in marine oil exploration. He will work with the GSI motor vessel *Sonic*, a converted 400-ton naval craft currently conducting marine seismic surveys in European waters.

T. G. Schad

T. G. SCHAD, formerly purchasing agent for Asiatic Petroleum Corp., has been assigned by the company to a new position as executive assistant to the vice president in charge of the Materials Department. He will undertake technical assignments connected with the management of that department. Mr. Schad has been actively engaged in the purchasing activities of Asiatic since 1920 and was appointed purchasing agent in 1945.

Howard S. McCray

HOWARD S. McCRAY has been named manager of the purchasing department of The Texas Co. He formerly was manager of operations in the refining department. He joined Texaco's refining department in 1926 at Port Arthur and has served as refinery superintendent at a number of Texaco plants.

Harold Rabling

HAROLD RABLING, international oil executive, retired December 1 as a director of Standard-Vacuum Oil Co. He joined the Stanvac board at its New York headquarters in 1952, and during the past year has been responsible for all of that company's marketing activities.

BP KEEPS THE WHEELS TURNING

WHENEVER metal moves against metal, oil is vital: lubricating oil in many grades and varieties. Oil for axles and springs, gear boxes and engines. For the delicate mechanism of a watch and the massive bulk of a 150-ton locomotive.

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U. S. Refinery Patents Light and Middle Distillates

(*Continued from page 66*)

separating aromatics therefrom. The gasoline is extracted in a first zone with a selective solvent and in the presence of gas oil raffinate as a stripping agent to produce a primary extract containing an aromatic gasoline component and a raffinite containing a parffinic gasoline component. The primary extract is separately stripped in a secondary extraction zone with gas oil raffinate to remove the aromatic gasoline component. A gas oil fraction is extracted with the extract from the stripping operation and a gas oil raffinate is withdrawn as a single stream for use in the two stripping operations. Each gasoline extraction raffinate and gas oil extract is flashed to remove solvent and is subsequently distilled to recover paraffinic and aromatic components.

Extractive distillation is applied to the separation of xylenes in Sinclair Refining Co.'s 2,721,170 (V. A. Johnson). O-xylene is separated from isomeric xylenes by distilling a hydrocarbon mixture at 310-330°F and taking overhead a fraction containing most of the isomers. This concentrate is charged at 300-320°F to extractive distillation with nitro benzene, phenol, dimethylphthalate or aniline, which has been preheated to 340-360°F. The solvent rich fraction withdrawn from the bottom zone contains most of the o-xylene.

Refining of Catalytic Cracking Feed Stocks—Recognition of the importance of catalyst deactivants in feed stocks and of the refractory nature of certain aromatic compounds during cracking has resulted in a number of patents, pertaining to the upgrading of such fractions.

E. M. Charlet and K. P. Lanneau (2,717,864 to Esso Research & Engineering Co.) subject a catalytic cracking feed stock to selective hydrogenation over catalysts consisting of compounds of group VI and group VIII of the periodic system. At a hydrogen consumption of less than 600 cft./bbl, a substantial proportion of aromatic constitutents containing at least four condensed aromatic rings per mole are converted. Pressures of 500-3000 psig. and temperatures in the range 100-1000°F are employed. A. P. Lien and D. A. McCauley (2,722,502 to Standard Oil Co. of Indiana) refine mixed hydrocarbon oils to remove aromatic hydrocarbons, organic sulfur compounds and phenolic compounds. The treatment is carried out with tallium monofluoride in the presence of enough anhydrous liquid HF to form a separate HF rich phase. Between 0.1 and 25 wt.% tallium fluoride and 30-300 vol.% HF are used at temperatures below 500°F. According to Standard Oil Co. of Indiana's 2,723,218 (D. A. McCauley and A. P. Lien) hydrocarbons containing poly alkyl benzenes, polynuclear aromatics, organic sulfur compounds and phenols are treated at 50-100°F for 5-60 minutes with 10-50% vol.% of HF, containing 0.1-25 wt.% titanium tetrafluoride. A raffinate phase from this treatment contains a purified oil.

L. D. Rampino in 2,719,110 (to Tide Water Associated Oil Co.) describes a refining treatment of a heavy catalytically cracked naphtha containing 2-3% diolefins and substantial amounts of pyrroles and nitrogen bases. Treatment is with 10-35° Baume sodium hydroxide. After separating the spent sodium hydroxide the naphtha is contacted in liquid phase at 275-400°F with molten potassium hydroxide containing not more than 30% water under conditions to extract all the pyrroles while retaining the diolefins. The naphtha is then treated with sulfuric acid of less than 40% strength to extract nitrogen bases, while retaining diolefins.

Miscellaneous—Oxy Catalyst, Inc.'s patent 2,718,-460 (W. M. Bowen III) describes a multiunit catalytic assembly for the oxidation of gases. It is adapted to provide an extended area of catalytically active surface distributed through a predetermined volume. A layout of this arrangement is shown in the accompanying diagram.

A sweet, color stable good burning oil is produced from a sour, high sulfur petroleum distillate boiling between 325-550°F according to J. H. Krause (2,717,-859 to Standard Oil Co. of Indiana). The feed is treated with 4-10 lbs./bbl. of 96-99 wt.% sulfuric acid at 150-170°F for 5-15 minutes. Acid sludge is separated. The resulting oil is then treated with 2-5 lbs./bbl. of fresh 96-99% sulfuric acid at 90-130°F for 5-15 minutes. The higher the temperature in the first treating stop, the lower it is in the second. Sludge is again separated and the refined oil is neutralized.

Mahogany sulfonic acids are the subject of H. L. Johnson's 2,717,265 (to Sun Oil Co.). They are prepared by sulfonation from a mineral oil having at least 1.2 aromatic rings per mole. Prior to sulfonation, the mineral oil is hydrogenated in liquid phase to effect a decrease of at least 0.005 in the refractive index of the aromatic portion of the oil and a decrease of not more than 15% in the aromatic content of the oil.

B. Orkin in 2,661,380 (to Socony-Vacuum Oil Co.) describes the oxidative dehydrogenation of naphthenes at 600-775°F. A mixture of hydrocarbons and oxygen is passed over a catalyst consisting of silica gel, tellurium oxide, or silica gel and chromia. An excess of 100-400% of oxygen over that stoichiometrically required is used.

M. W. Kellogg Co.'s 2,714,126 (P. C. Keith) deals with the production of acetylene from methane (see attached process drawing). A refractory powder is preheated to 1800-2000°F and mixed with preheated methane. The amount of powder must be large enough to rapidly heat the hydrocarbons to the desired temperature. After passing through a reaction zone, the vapor-solids mixture enters an enlarged zone, where all solids are dropped out.

New Panalarm Tested Checks Systems on Location

A compact testing device to check the performance of plug-in relays and flashers employed in Panalarm annunciator systems has been announced by the Panalarm division of Panellite, Inc., Skokie, Ill. The new tester was developed to meet the needs of annunciator systems, widely used throughout the process industries, which serve to alert personnel to off-normals in processing or manufacturing and can supply information on the off-normal cause-and-effect sequence of events. The unit weighs approximately 12 pounds.

TOUGH AS CORNISH GRANITE

In its time, the old engine-house at Carn Brea lowered many generations of miners deep down into the granite to dig for tin. Now it is only a picturesque ruin.

But not far away the firm that made tools for the same nineteenth-century miners is very much alive. Climax drills, compressors and pneumatic equipment now go all over the world. Tough as granite and as rugged as the ancient Cornish miners, they are famous for hard work and one hundred per cent reliability in the very worst conditions.

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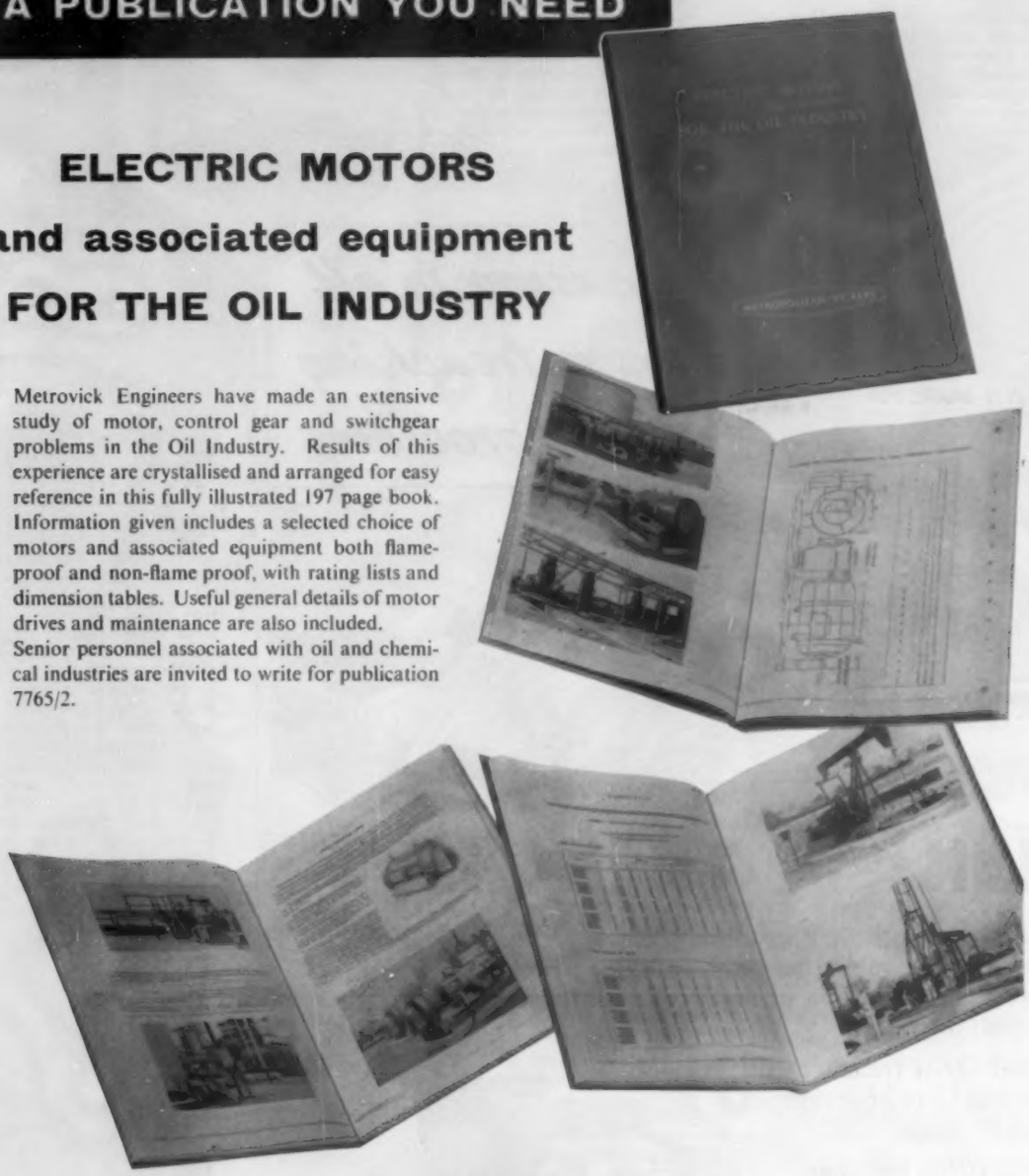
Senior personnel associated with oil and chemical industries are invited to write for publication 7765/2.



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Member of the A.E.I. group of companies

Motors for the Oil Industry

New Home For Seismograph Service Corp. on 25th Anniversary

A new $800,000 facility to house the general offices and laboratories of Seismograph Service Corp. will be located on 20 acres of land southeast of Tulsa in a rapidly growing light industrial area. The buildings are scheduled for completion in November, 1956, in time for SSC's 25th anniversary.

Sinclair President to Aid N.Y. Library

P. C. Spencer, president of Sinclair Oil Corp., will enlist the help of the petroleum industry for The New York Public Library's 1955-56 fund drive. Mr. Spencer will work with other business and civic leaders in trying to raise $430,000 to cover the difference between the Central Reference Library's income from endowments and its estimated operating expense for the year ahead.

Papers Presented at A.I.Ch.E. Convention

Recent developments in the science of distillation were reported at the recent annual convention of the American Institute of Chemical Engineers in Detroit. Among the papers presented were: "Bubble Growth Studies for Perforated Plates" by A. I. Johnson, D. G. Robinson and C. P. Michellepis of the University of Toronto, Toronto; "Measure Mass Transfer Inside Drops" by F. P. Pike, W. T. Withers, Jr. and K. O. Beatty, Jr. of North Carolina State College; "Formation of Air Bubbles from Submerged Orifes" by J. C. Bryan and H. J. Garber of the University of Tennessee; "Multicomponent Distillation—Calculation of Minimum Reflux" by J. B. Bachelor of San Gabriel, Calif.; and "Wall Effect on Bubbles Investigated at Illinois Tech" by Sieji Uno and R. C. Kintner of the Illinois Institute of Technology, Chicago.

The answer to all your trenching problems

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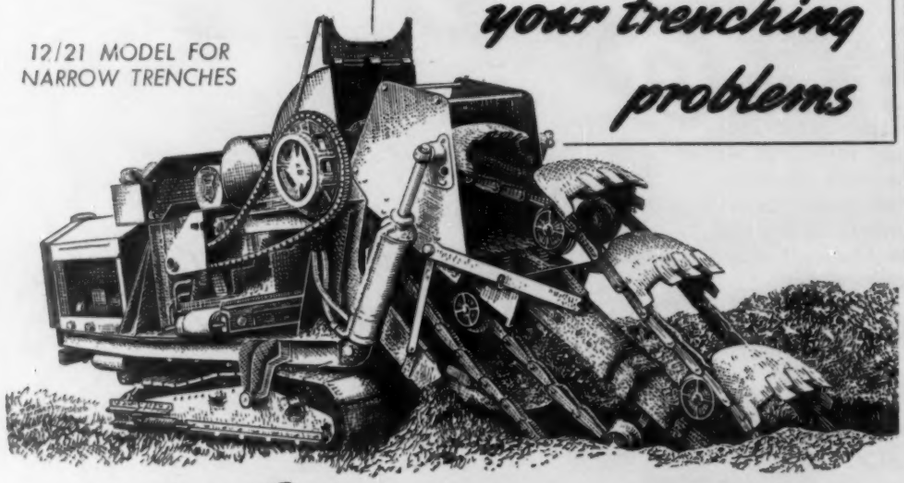

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World-renowned, all-British ALLEN plant is recognised as the finest obtainable. For hard work, long life, freedom from breakdown and economical maintenance, it has no equal anywhere.

The Model 12/21 trencher will cut clean, fast trenches 13 to 21 inches wide down to 6 ft. deep.

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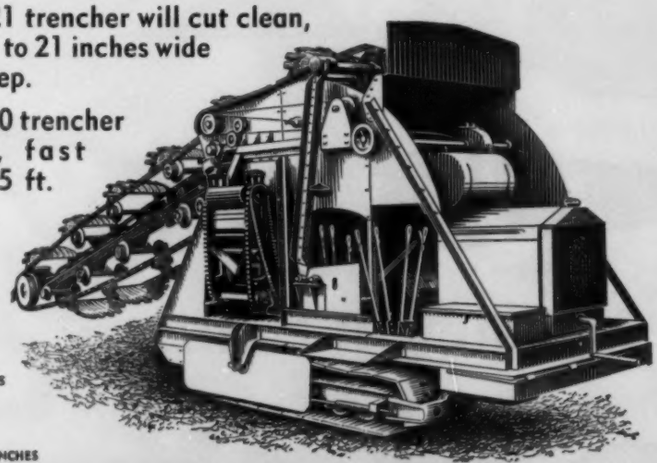

Illustrated catalogues sent on request.

16/60 MODEL FOR WIDER TRENCHES

JOHN ALLEN & SONS (OXFORD) LTD. COWLEY OXFORD ENGLAND

Joseph F. Weiler

Joseph F. Weiler has been appointed attorney in charge of the legal department of Texas Eastern Transmission Corporation. He will supervise the activities of that department under the direction of Charles I. Francis, vice president and general counsel.

Phillips Petroleum Reports On LPGas Sales

A study by Phillips Petroleum Co., Bartlesville, Okla., indicates that LPGas sales in 1955 increased by 880,467,000 gallons, representing a 17.2 percent gain over 1954. This increase lifted total sales to an estimated 6,006,000,000 gallons.

Use sectors were as follows: *domestic and motor fuel*, up 15.3 percent to 3,661,000,000 gallons, with house heating in largest domestic use; *industrial and miscellaneous*, increased by 7.3 percent to total of 431,000,000 gallons; *gas manufacturing*, decreased by 10.9 percent to a total of 171,000,000 gallons to continue trend started in 1951; *chemical manufacturing*, use of LPGas in the chemical industry advanced 20.2 per cent for a total of 1,262,000,000 gallons; *synthetic rubber*, use of LPGas for manufacture of synthetic rubber components (under stimulus of private ownership and record auto production) registered the biggest single category increase—56.3 percent—for a total of 481,000,000 gallons.

Robert R. McCartney

Clark Bros. Names Overseas V.P.

Robert R. McCartney has been appointed vice president in charge of overseas operations for Clark Bros. Co., Olean, N.Y., one of the Dresser Industries.

FOR HIGH TEMPERATURE SERVICE

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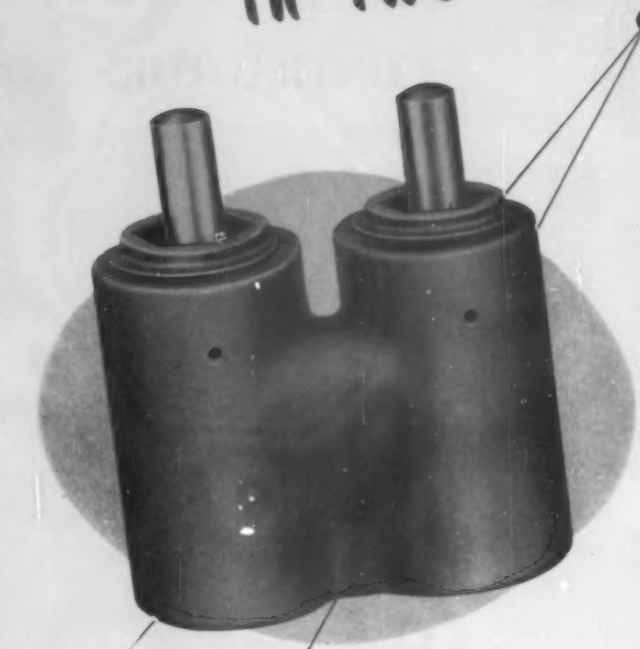

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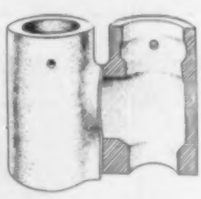
OSBORN-OHIO RETURN BENDS
TYPE 1640

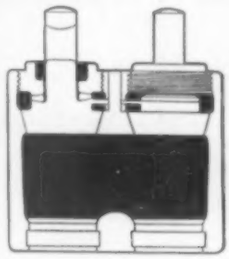
Osborn-Ohio Return Bends for Refineries and Chemical Plant, are designed to take full advantage of the principle of Directional Solidification. For the user this means castings that give better service over a longer period.

Type 1640 is recognized for its ability to withstand higher temperatures and pressure, and in common with all types of Osborn-Ohio fittings, can be depended upon to give first rate performance.

TYPE 1640



For strength at high pressure and temperatures. Detailed recommendations for particular conditions will gladly be given.



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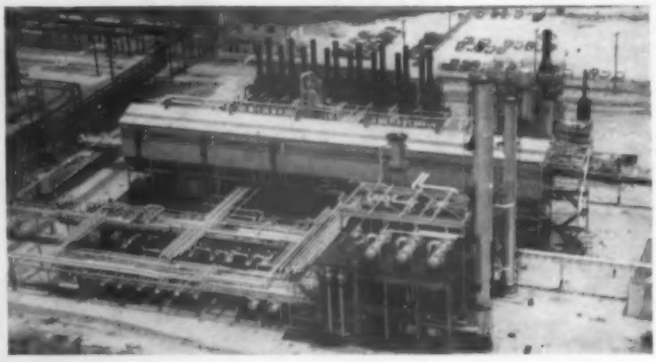
ETHYLENE—LOCATION and ECONOMICS



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To supply the rapidly expanding market economically and efficiently, five ethylene plants are at present being designed by the Corporation for clients located in four widely separated areas: the Gulf Coast, the Middle Atlantic States, Great Britain and France.

To the design and construction of these plants the Corporation brings the experience of 20 years in the production of ethylene from many different feedstocks, plus an extensive background in producing petrochemicals derived from ethylene and its by-products.

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Newton P. Selover and Jack P. Waneck,

Newton P. Selover (left), general manager of export division, and Jack P. Waneck, export sales manager, for Manning, Maxwell & Moore, Inc., manufacturers of safety relief valves, gauges, mechanical and electronic instruments and other products for the international petroleum industry, left New York on Jan. 20 for an extended trip through Europe. They expect to visit leading international oil companies in England, France, Holland and Italy. Their trip, which will last six to eight weeks, includes consultations with officials of Dewrance & Co. Ltd. in London; M. T. P.-SAPAG in Paris; Deutsche Babcock & Wilcox at Oberhausen in Western Germany and Societe Carraro & Co. of Milan, all of whom are licensees of Manning, Maxwell & Moore. They were accompanied on the flight to London by Mr. and Mrs. Charles A. Moore. Mr. Moore is a vice president, treasurer and a director of the company and a grandson of one of the original partners who started the company.

Texas Eastern Creates New Post

W. T. Thagard, III, has been appointed director of plans and economic research for Texas Eastern Transmission Corp., Shreveport, La., a new position created to take care of Texas Eastern's growing activities.

Forms New Export Firm

Electro-Tech International, Inc. has been formed in Houston to handle non-domestic seismic operations, supplies and engineering of Electro-Technical Labs., Inc., according to H. A. Sears, president. J. H. Fuchs is vice-president and general manager of the new company.

Freestate Industrial Names New V.P.

Jack Clarke has resigned as director of public relations for Texas Eastern Transmission Corp. to become executive vice-president of Freestate Industrial Development Co., Shreveport, La. He will act as general manager of Freestate, the first planned industrial development in this area, and assist in the administration of Cherokee Farms, Inc., an adjacent residential subdivision. Freestate offices will be in the Henry C. Beck Building in Shreveport.

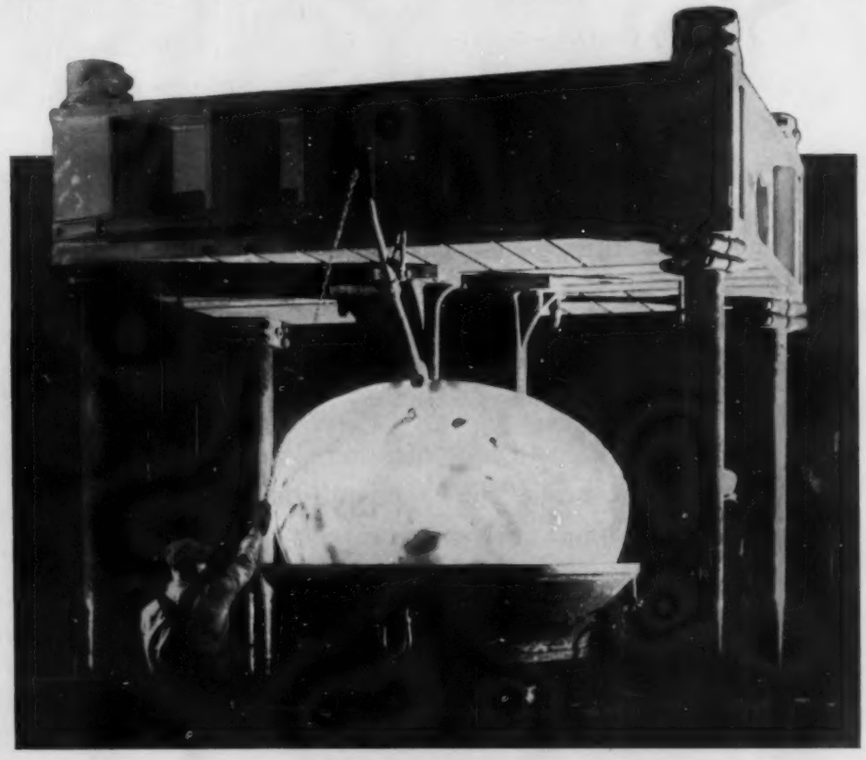
Equitable Delivers First California Company Twin Screw Supply Vessel

Equitable Equipment Co. of New Orleans has delivered the *M. V. Tioga*, first of two twin screw 131-foot supply vessels built for The California Co. for service offshore. The *M. V. Tioga* has gone into service delivering drill stem, casing, mud, cement, fuel oil and fresh water to the many fixed and portable drilling platforms operated by The California Co. in the Gulf of Mexico. The ship was built at the Madisonville Yard of Equitable, and was designed by Friede and Goldman, Inc.,

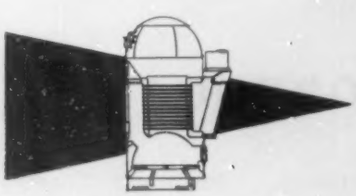
C O C H R A N B O I L E R C O N S T R U C T I O N · N O . 2

A series of descriptions to demonstrate Cochran craftsmanship.

Heavy Pressing



COCHRAN boilers are built from the finest quality Siemens-Martin mild steel plates. The furnace crown, as shown, is pressed from one plate and reaches hemispherical form without weld or seam; this process may require as many as nine heats. By similar hot pressing operations the tube-plates and ogee ring are formed. Whenever a plate is locally heated for shaping, the whole of it is thereafter annealed. Constant observance by skilled craftsmen of best boilermaking practice underlies much of the success of the COCHRAN boiler.



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CENTRIFUGAL PUMPS
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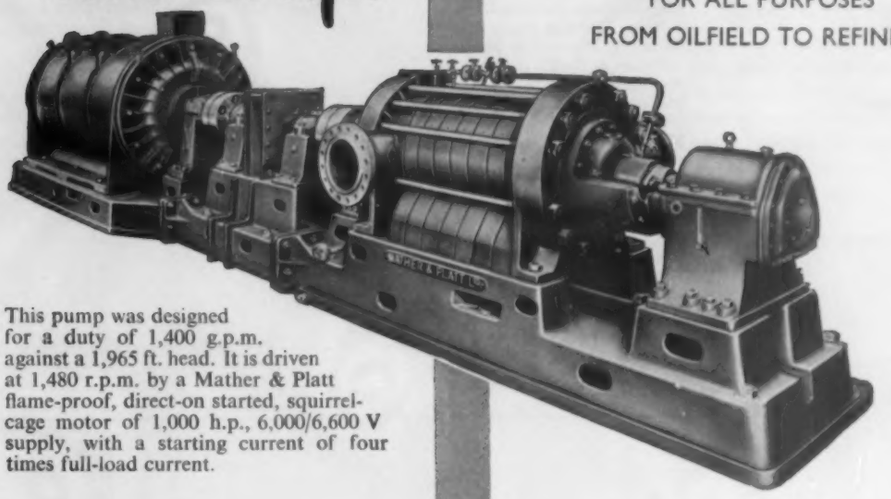
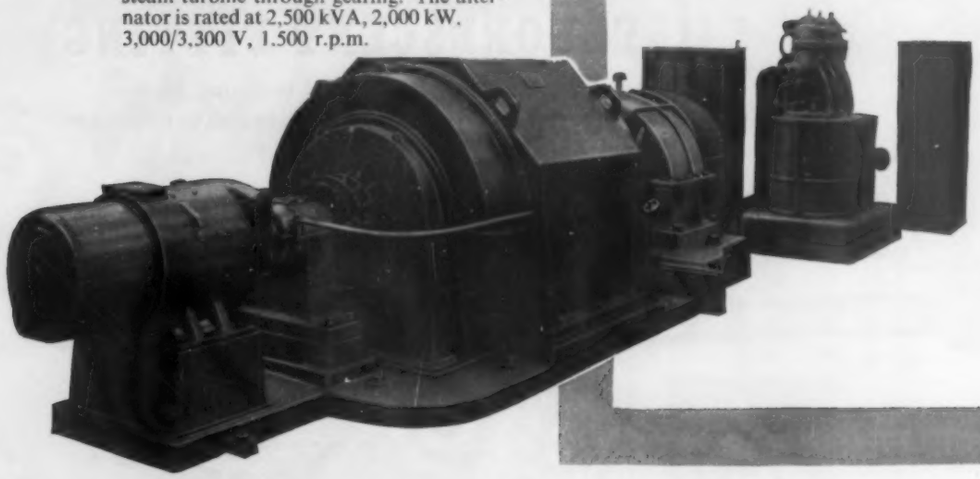
FROM OILFIELD TO REFINERY



This pump was designed for a duty of 1,400 g.p.m. against a 1,965 ft. head. It is driven at 1,480 r.p.m. by a Mather & Platt flame-proof, direct-on started, squirrel-cage motor of 1,000 h.p., 6,000/6,600 V supply, with a starting current of four times full-load current.

A duct-ventilated alternator coupled to a steam turbine through gearing. The alternator is rated at 2,500 kVA, 2,000 kW. 3,000/3,300 V, 1.500 r.p.m.



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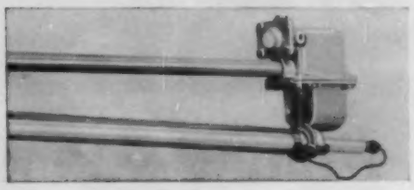

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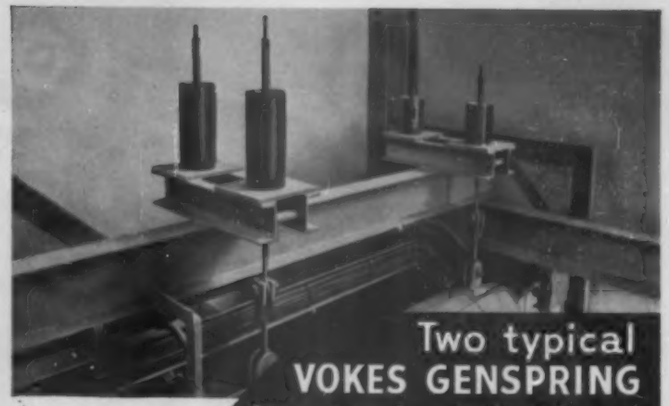

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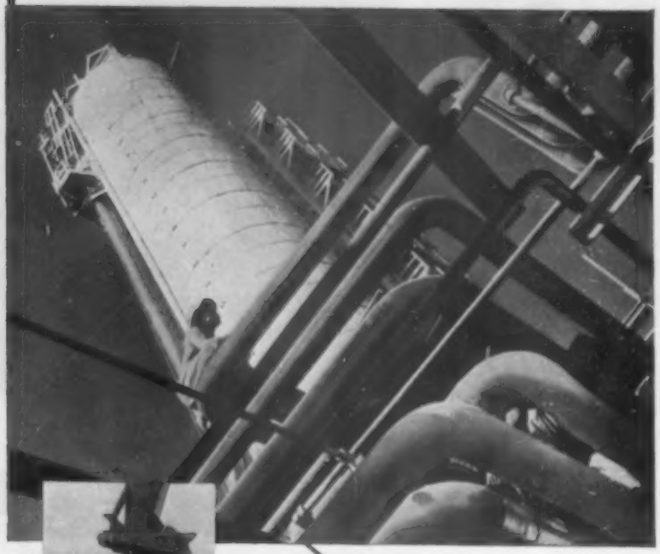

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